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THE MEDICAL SERVICE IN THE FIELD OF THE GERMAN ARMY.

BY COL. F. HOWARD, A.M.S. (R.P.)

THE organisation of the medical department in the field is regulated by the "*Kriegs-Sanitats-Ordnung*" of January 10, 1878, which embodies all the experience gained in the war of 1870-1871. As in the British Army, the Medical Service, with the Army of operations, is divided into the medical *personnel* attached to the various units, the Bearer Companies, and the Field Hospitals. On the lines of communication are the immobile war and lines of communication hospitals, the committees for the transport of sick and wounded, the sanitary trains, the ordinary trains for sick and wounded, the hospital stores depôts and the hospital stores reserve depôt. In the home territory are the reserve hospitals, the fortress hospitals, and the medical *personnel* of garrisons. The Military Medical Service is aided and supplemented by the Auxiliary (Volunteer) Medical Service.

MEDICAL SERVICE WITH THE ARMY OF OPERATIONS.

The chief of this Service is the Surg.-Gen. of the armies of operation, who belongs to the Imperial Head Quarters, and who is responsible for the whole work of the medical depart-

ment in the field and its harmonious relations with other branches. With each army there is a Surg.-Gen. attached to Head Quarters who is director of the medical department of the Army and who has the same relations with the Inspector of Lines of Communication of the Army as has an Army Corps Commander. He has the powers of a Brigade Commander over all the medical *personnel* attached to the Army. He inspects all Medical formations and establishments belonging to the Army, superintends the whole Medical Service, forwards returns to the Surg.-Gen. of the Armies as to the establishment of hospitals, changes in *personnel*, evacuations of the sick, &c., &c.; controls the movements of Field Hospitals through the Surgs. Gen. of Army Corps, and is adviser on all medical and sanitary matters to the Commander of the Army. Frequently a Civil Surgeon of distinction is attached as adviser to the Surg.-Gen.; but his functions are purely consultative, and he has no power over the *personnel*.

In each Army Corps there is a Surg.-Gen. at the head of the Medical Service, who is under the Commander of the Corps in all matters except such as refer to technical administration, for which he takes his orders from the Surg.-Gen. of the Army. This Medical Officer is already appointed in time of peace, has supreme charge of all arrangements for the mobilisation of the Medical Services belonging to the Army Corps, and arranges for the purchase and storage of all medical material and hospital stores. In war he must keep himself thoroughly acquainted with the distribution of all the medical formations of his Army Corps, and by frequent inspections ascertain that the whole Medical Service is regularly carried out, and that the sick and wounded are properly treated. He submits proposals to the Corps Commander for the employment and distribution of the Field Hospitals in the event of a battle, gives orders to them and to the 3rd Bearer Company, inspects the Medical Service during an action, and arranges for the evacuation of the wounded thereafter. He gives orders for field hospitals to remain behind in the event of the advance or retreat of his Corps and makes arrangements with the Lines of Communication authorities for the Field Hospitals thus left being rendered available again for their Corps as soon as possible, and for the replenishment of all stores expended. His staff consists of a civil consulting surgeon,

a medical officer as Secretary, an apothecary (official) and two, hospital assistants, with four officers' servants, one trained driver, one two-horsed baggage waggon, and six officers', &c., horses.

Each division has a divisional Surgeon who, for discipline, &c., is under the divisional Commander, and for technical matters under the Surg.-Gen. of the Army Corps, or, in an independent division, under the Surg.-Gen. of the Army. He also is already appointed in peace, and superintends the mobilisation of the Bearer Company, and the supply of medical stores, &c., to the units of the division. In war he attends daily when orders are given out and takes those for the Bearer Company or the Field Hospitals attached to the division. When an action begins he chooses the points for the establishment of a dressing station by the Bearer Company, or for that of the Field Hospitals and submits his proposals for the sanction of the divisional Commander, but in urgent cases he may give his own orders. During the action he keeps his General informed of the positions of the medical formations, and superintends their working. His place will usually be with the dressing station of the Bearer Company; but it is his duty to inspect also the regimental first aid stations. He has a hospital assistant and a groom attached to him and two riding horses.

Regimental Medical Arrangements.

Each unit has its Medical Officers, hospital assistants, and stretcher bearers, the two former classes carrying instrument cases, and the hospital assistant also a flask for dressing wounds. In the Infantry each company has four stretcher bearers and each battalion a medical store waggon, in which are carried two bandaging knapsacks and four stretchers.

Cavalry Regiments have a similarly equipped medical store waggon, and in each battery in No. 1 store waggon are carried a medical store chest, a bandaging knapsack and a stretcher.

Each soldier has a packet of bandaging material sewn into the left flap of the skirt of his tunic.

When troops are halted, a regimental Medical Service is organised as in peace, and sick wards are formed, which are taken over by the Lines of Communication authorities when the troops move.

On the march, men with slight ailments are taken along

with troops; those who cannot be taken are left in charge of the local authorities, or are formed into detachments by divisions or Army Corps, and sent under proper medical supervision to the nearest hospital in rear on requisitioned carriage. In action each unit forms a first aid station (*Truppen-Verbandplatz*), with its medical *personnel* and medical store waggon or medical canteen, out of range of the rifle fire of the enemy. With this one half of the medical officers and hospital assistants remain, and here the regimental stretcher bearers leave their rifles and knapsacks and put red bands on their left arms. Then they, with the other half of the medical officers and hospital assistants, the latter carrying dressing knapsacks, follow the troops into action and bring back the wounded to the first aid station. The first aid stations of general units are often united into one.

Bearer Companies.

The establishment of a Bearer Company is given on p. 72 of the "Handbook of the Medical Organisations (chiefly for War) of Foreign Armies," and the only alteration needed, so far as I can learn, is that the medical officers are eight in number instead of seven.

The second line of medical assistance is formed by the Bearer Companies (*Sanitats Kompagnien*), of which one is attached to each division and a third remains at the disposal of the Surg.-Gen. of the Corps. These Bearer Companies form part of the train battalion of the Army Corps. The duty of a Bearer Company in action is to search for and bring in the wounded from the field or first aid stations, and to form a dressing station where their wounds are dressed and soup or cordials administered to them. The point where this dressing station is to be established is determined by the Divisional Commander after consultation with the Divisional Surgeon, and he also determines whether one or both sections of the company should be employed. The point chosen should not be far from the fighting line, but as a rule, out of rifle range of the enemy. A farm or village is usually chosen, failing which, the proximity of water is the first consideration. If the troops advance, one section may be pushed forward, the other following when its dressing station is emptied. The dressing station is marked at night by a red lantern, by day by two flags, one

white with the Geneva Cross, the other of the national colours. Between this dressing station and the minor first aid stations, established by the Medical Officers attached to regiments, work the ambulance waggons of the Bearer Company, and its bearers, aided by those of regiments, search the battle field for the wounded and bring them in to be dressed. Once their wounds are dressed the severely wounded are transported as soon as possible to the nearest Field Hospital on requisitioned waggons, those less severely wounded being sent by detachments on foot. At the dressing station the Surgeon and hospital assistants are divided into three sections. The *personnel* of the first section receive the wounded, point out where they are to be placed, cut their clothes away from their wounds, clean and inspect the latter, and attach a card, with the result of the examination written on it. Slightly wounded men have their wounds dressed by this section and are collected together in one place. The *personnel* of the second section attend to the more severely wounded and apply the surgical appliances in case of fractured limbs. The third section carry out more important surgical operations when it is necessary that such should be undertaken before the patient is removed. The Paymaster of the Bearer Company superintends the distribution of cordials or refreshments, and takes charge of valuable articles belonging to the wounded. When the action is over and the wounded have all been brought off the battle field and despatched to the Field Hospitals (for which purpose the ambulance waggons of the Bearer Company may only exceptionally be used), the Bearer Company packs up its material and follows the troops to which it belongs.

Field Hospitals.

The constitution of Field Hospital will be found on page 73 of "The Handbook of Medical Organisations (chiefly for War) of Foreign Armies." The only alteration needed is that four Assistant Surgeons are allowed, instead of three as there stated.

These hospitals (*Feldlazareth*) form the third line of assistance and twelve are mobilised for each Army Corps of two divisions, four of which generally march with the first line of trains, the remainder with the second line; each can receive

200 sick or wounded, and is divisible into two sections. During an action these hospitals are established as directed by the Corps Surgeons, and to them are despatched the wounded after preliminary treatment at the dressing stations of the Bearer Companies.

As soon as the Field Hospital has been established and the wounded properly attended to, the medical officer in charge of it informs the Corps Commander, the Inspector of the Lines of Communication and the nearest Station Commandant, giving the number of wounded and that of those fit or unfit to be removed, as well as the amount of *personnel* and material required to relieve the hospital. The main object of the medical officer in charge should be to get his hospital emptied and to follow his Corps. If the army has to retreat, the horses and all *personnel* and material not absolutely required retire with it, while the wounded are left behind under the protection of the Geneva Convention.

Evacuation of Patients from Field Hospitals.

As patients are discharged cured from hospital they are formed into small detachments and handed over to the Lines of Communication authorities, who send them up to their regiments. As regards the sick or wounded who can be moved, the medical officer in charge of the Field Hospital puts himself in communication with the nearest Committee for the transport of sick and wounded, and informs it of the number who require sitting or lying down accommodation and of those with contagious diseases who require to be moved with special precautions. Notice is sent to the Field Hospital when its patients can be evacuated, and the medical officer in charge has to arrange for their transport, on requisitioned waggons furnished by the nearest Station Commandant, to the entraining Station. The patients who cannot be moved are usually collected into an immobile War Hospital formed on the spot, and the Field Hospitals then rejoin their Army.

Medical Service on Lines of Communication.

On the staff of each Inspector of these lines is a Surg.-Gen., whose duties are to superintend the Medical Service within the sphere of action of the Inspector. He corresponds

with the Surg.-Gen. of the Army direct, and generally also direct with the Surg.-Gen. of the Army Corps. He is in charge of all medical formations within his sphere of action, but certain restrictions are imposed on him with regard to units, such as Field Hospitals left behind by the army of operations which have to be sent after their Corps as soon as possible. Otherwise his obligations are much the same as those of the Surg.-Gen. of an Army Corps. He gives orders for the formations, occupation, relief, evacuation and breaking up of all hospitals, superintends the performance of their duties by the hospital inspectors, arranges for the evacuation of sick and wounded, distribution of hospital *personnel*, including that of auxiliary societies (the latter in concert with the delegate), superintends and inspects the hospitals and sanitary service, arranges for the replenishment of all stores, and controls the medical administration and expenditure. He is allowed three riding horses, two grooms, one train driver and a two-horsed baggage waggon, which carries also a medical canteen.

Hospital Inspector.

On mobilisation, each Army Corps places at the disposal of the Surg.-Gen. of the Lines of Communication of the Army to which it is attached, a hospital inspector, who is usually a Medical Officer of superior rank. His duties are to make constant inspections of all hospitals in the district assigned to him, to make arrangements on the spot to remove any difficulties experienced in their working, to organise war and lines of communication hospitals, to hasten the relief of the Field Hospitals and the evacuation and distribution of the sick and wounded, &c. In their districts the hospital inspectors are the direct chiefs of all the medical *personnel*, and have the disciplinary powers of the Commander of an independent battalion, each has two riding horses, a hospital assistant and a groom.

Depôts of Sick or Foot-sore Men.

In each station of the Lines of Communication preparations are made for the treatment of sick and wounded, but as far as possible even in an enemy's country, the services of local medical practitioners should be made available for the purpose.

When a number of ailing or foot-sore men have been left behind, a depôt of such may be formed and attached to a Lines of Communication Hospital.

Lines of Communication Hospitals.

These hospitals (*Etappen-Lazareth*) are intended to receive the sick of troops passing through those of the Lines of Communication, and those from trains of wounded or sick who cannot bear further transport. The buildings to be occupied are detailed by the Station Commandant and, if necessary, tents or hut barracks may be used. When local medical attendance is not available, medical officers may be detailed for these hospitals by the Surg.-Gen. The subordinate *personnel* is generally supplied by auxiliary societies. Where Committees for the transport of sick and wounded or their Sub-committees are stationed, such hospitals must of course be organised, as also at all important railway stations and junctions.

War Hospitals.

These hospitals (*Kriegs-Lazareth*) are those formed to take over the wounded who cannot be moved when the field hospitals start to follow their Corps. The *personnel* and material of these hospitals is given on page 75 of the "Handbook of the Medical Organisations (chiefly for War) of 'Foreign Armies.'"

Hospital Store Depôts.

For each inspection of Lines of Communication there is formed a Hospital Store Depôt (*Lazareth-Reserve-Depôt*), containing medicines, surgical instruments, bedding, linen, clothing, utensils, &c., in quantity about equal to the requirements of an Army Corps except as regards those common articles which can be purchased as required. This depôt is usually kept at the terminal station of the Lines of Communication, and is carried forward in the case of an advance of the latter, on its own requisitioned carriage. From it the Medical Stores of the troops of all mobile medical formations, and of the war and Lines of Communication Hospitals, are replenished or supplied respectively, and such issues are replaced without loss of time from the Hospital Reserve Depôts. The *personnel* of each is composed of two Lieutenants, two Hospital Inspectors, four apothecaries, six makers of surgical instruments, twelve under

officers, and six orderlies, servants, &c. To each is attached a transport column consisting of two under officers and twenty train drivers, with twenty 2-horsed waggons.

Hospital Stores Reserve Depôts.

. These are formed under the orders of the Ministry of War in the home territory at the collecting station and form the first section of the General Store Depôts of material at those stations. Their *personnel* consists of one hospital inspector, one accountant, one apothecary and four hospital assistants and store keepers. From them the Hospital Store Depôts are supplied.

General Evacuation Service Organisation.

The evacuation of the sick and wounded is supervised by the Surg.-Gen. of the Armies in the Field in communication with the chief of the Railway Service, and he alone has the power of disposal of the sanitary trains. Under his orders the Surg.-Gen. of Armies and Lines of Communication of Armies superintend the service in their respective spheres. The executive bodies are the committees for the transport of sick and wounded, and the medical officers attached to home Line Commandants, and the patients are transported in special sick or ordinary trains.

Committees for the transport of sick and wounded are formed in each inspection of Lines of Communication, and comprise each one medical officer as President and two surgeons and four assistant surgeons as members, with a small subordinate *personnel*. Each can be divided into three sections, each with two Medical Officers, two hospital assistants, three sick attendants, and two Officers' servants. A number of medical men and medical subordinate *personnel* from the auxiliary societies are placed at the disposal of each Committee to furnish the necessary attendants in trains with sick and wounded. Wherever the Committee or a section of it is stationed, a Lines of Communication Hospital must be opened, and at every change of station the railway authorities, the Surg.-Gens. of Army Corps, the hospital inspectors, should be informed. The duties of the Committees are simply to arrange for the evacuation of the sick and wounded, and to ascertain that all necessary arrangements have been made in the trains destined to take them to the rear. When the trains pass out of the sphere of action of the Lines of

Communication authorities, their further progress and the distribution of the sick and wounded are superintended by the Medical Officers attached to the Line Commandants, at the disposal of each of whom is placed a certain number of reserve hospitals.

RAILWAY CONVEYANCE OF SICK OR WOUNDED.

The special trains in which sick and wounded are evacuated are of two kinds, viz., sanitary trains (*Sanitats-Zuge*) and sick trains (*Kranken-Zuge*). Sanitary trains are again divided into hospital trains (*Lazareth-Zuge*) and auxiliary hospital trains (*Hulfs-Lazareth-Zuge*). The first of these take only those patients who must travel lying down and are permanent organisations with special rolling stock. The auxiliary hospital trains are for the same purpose and are formed as required with ordinary rolling stock specially fitted up. Sick trains are for the conveyance of such patients as can travel sitting and are formed with ordinary rolling stock. The constitution of the hospital train for carrying lying down patients is given in the foot-note at p. 78 — "The Handbook of the Medical Organisations (chiefly for War) of Foreign Armies." Hospital trains travel day and night, but, as a general rule, sick trains only travel by day, and half at nights at points detailed by the Lines of Communication authorities. In the daily service of trains to the rear, established on the Lines of Communication, it is usual to assign one train once for all as a sick train. Two field gendarmes and a guard of one man per carriage under an under officer accompany each train.

Being limited to space I am not able to go fully into remaining arrangements, viz., the Medical Service in war in the home territory, and societies for aid to the wounded; this latter I understand is to be dealt with separately.* In regard to territoral medical arrangements a territorial Principal Medical Officer is appointed in each Army Corps district, whose functions are the same as those of a Surg.-Gen. of an Army Corps in peace, viz., inspection of military and civil hospitals for sick and wounded; ascertaining that the administrative and

* *Vide* The German Regulations for utilising Voluntary Aid in War. By Lieut.-Col. W. G. Macpherson, C.M.G., R.A.M.C., JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. i., p. 459.

sanitary regulations are properly carried out, and the patients who have recovered are not unnecessarily detained. He also superintends the instruction of the men of the *Ersatz* reserve called up for service as hospital assistants to replace losses in the medical *personnel* of the mobile army. As long as the fortresses of the interior are not armed the Hospital Service is carried on as in peace, but the Principal Medical Officer of the place has to inspect the store depôts and ascertain that all is in readiness for the efficient organisation of the fortress hospitals in case of siege. One of his chief duties is to send away as soon as possible all sick who are not likely to recover to the nearest hospitals in open towns, so as to keep the fortress hospitals unencumbered. No sick from the front are ever sent to a fortress hospital until all danger of the place being invested has passed. The Medical Service with immobile troops is carried on as in peace, civilian medical aid being utilised if no military medical officers are available. The recruiting service is carried on only by military medical officers specially detailed.

Reserve hospitals are specially formed by the military territorial authorities, and this name is also assumed by all existing military hospitals not in fortified places. The *personnel* provided for every 100 sick, consists of one or two medical officers, one assistant medical officer, three hospital assistants, six hospital attendants, one hospital inspector—one apothecary is allowed for 400 sick. This *personnel* is drawn, as far as possible, from the reserve or *Landwehr;* but as few medical officers are available for such duties civil practitioners have generally to be called in. The hospital assistants and attendants are taken from untrained men of the *Ersatz* reserve, and thus men specially trained are set free for employment with the actual army. These hospitals are supplied and administered as are military hospitals in peace. All men discharged recovered are sent to the nearest Line of Communication station, where they are reclothed, rearmed and when their health is quite re-established are formed into detachments and sent to join their Corps or its depôt. Men discharged as unfit are sent to the depôt of their Corps.

THE GENEVA CONVENTION IN MODERN WARFARE.

By Major J. D. F. DONEGAN.
Royal Army Medical Corps.

Nowadays, when the aspect of war has been completely changed, when long-range guns and rifles have driven lances, cavalry charges and all movements based on close formation of troops from the arena of active warfare, it is only natural to suppose that the Geneva Convention, agreed to in the year 1864, should be a little behind the times and somewhat impracticable. The Convention, as it stands at present, is unsuitable for modern warfare, is liable to misconstruction, and, if carried out according to popular ideas, would undoubtedly interfere with military arrangements. In the opinion of the average civilian the Geneva Convention is like the charm from a witch, which gives absolute protection to the wearer of the badge. The ordinary officer, in a combatant capacity, has but vague ideas regarding its advantages or conditions, and chooses to remain so, oblivious of the fact that the rules of the Convention are published in the "Manual of Military Law." The medical officer who has worked under the flag sees very little protection for himself, staff, or patients.

The defects in the working of the Convention appear to be as follows :—

(1) The rules are not understood by general officers and others in command, more particularly the reading of Articles I., II., IV. and VI., which state as follows :—

Art. I.—"Ambulances and military hospitals shall be acknowledged to be neutral, and as such shall be protected and respected by belligerents so long as any sick or wounded may be therein; such neutrality shall cease if the hospitals or ambulances should be held by a military force."

Art. II.—"Persons employed in hospitals and ambulances comprising the staff shall participate in the benefit of neutrality whilst so employed, so long as there remain any wounded to bring in or succour."

Art. IV.—"As the equipment of military hospitals remains subject to the laws of war, persons attached to such hospitals cannot, in withdrawing, carry away any articles, but such as are private property.

"Under the same circumstances an ambulance shall, on the contrary, remain neutral."

The ambiguity of Article I., which says, "Military hospitals shall be acknowledged as neutral," and Article IV., which says, "The equipment of military hospitals is subject to the laws of war," is obvious. Perhaps it is due to an error in translation, and if so it should have been corrected in the "Manual of Military Law" in the interval existing between 1864 and 1896, the date of publication of the volume from which I quote.

Art. VI.—"Wounded and sick soldiers shall be entertained and taken care of to whatever nation they belong. Commanders-in-chief shall have the power to deliver immediately to outposts of the enemy soldiers who have been wounded in an engagement, when circumstances permit this to be done, and with the consent of both parties. Others may also be sent back on the condition of not again bearing arms during the continuance of the war."

Reading these articles as they stand, they are liable to be read, interpreted and acted upon in manners diametrically opposed; and this I shall try and prove by stating cases that have occurred in the late campaign in South Africa, and also giving an example of an anomaly that may at any time arise.

On November 5, 1899, at Elandslaagte, when the 18th and 26th British Field Hospitals and eighty-nine patients were being sent into Ladysmith from Dundee, the Boer authorities captured every single article of equipment under Article IV. and sent in the wounded in seven mule waggons. The officers commanding the hospitals expostulated and said a field hospital was an ambulance. The Boers, however, stuck to the strict letter of the law and pointed out the lettering on the boxes and equipment which distinctly stated 18th B.F.H., and 26th B.F.H. I myself was in command of the 18th B.F.H. on this occasion, and I explained that we had no ambulance with us; that even if we had, an ambulance only consisted of a waggon with two stretchers. The answer I received was that "if we had the waggons and stretchers we could keep them." I then said, "Would you take the mules?" Their reply was, "Certainly, provided they were not required for transport of wounded." I then went further and said, "If I had ambulance waggons marked as the equipment of 18th B.F.H., would you take them also?" The answer was, "If the waggons were marked as the equipment of

the hospital, under Article IV. they would be subject to the laws of war."

On reaching Ladysmith I reported this occurrence, but the general officer commanding held that the Boers were correct, and that the equipment was subject to the laws of war. The next day I went out under the white flag with a letter from the General, asking the late General Joubert for some tents and equipment, on account of the difficulty of obtaining supplies in a town under siege. General Joubert gave me permission to take some tents, but no equipment; and even while putting them on waggons violence was offered to the Kahars (natives of India) who were loading them up, therefore I was obliged to return with about one-eighth the original number of tents. This occurrence I also reported. If the Boers were correct on this occasion I presume they were also correct in their contention that they could fight one day and wear the Red Cross the next. When discussing this matter with them they said, "Show us any rule against it in the Convention," and I was unable to do so. In the continuance of the conversation I said, "I suppose you also consider it correct to fire a pom-pom out of an ambulance." Their answer was: "Yes, certainly, the foot-note to Article I. says, "neutrality ceases if the ambulance should be held by a military force, and this article proves that it can be held by a military force, otherwise neutrality could neither commence nor cease." "Besides," they added, "you take away your men's rifles in your ambulances, and there is nothing in the Convention to say you should take a rifle and leave a pom-pom." I replied, "We only remove the rifles of the men as there is no one else to pick them up, and nowhere else to carry them, and you could not expect us, when the men are killed or wounded, to leave their rifles on the ground." Their reply was unique: "Therefore, you cannot expect us to leave a maxim gun or a pom-pom behind when the men working it are wounded. None of our Burghers understand the mechanism. If those ignorant men tried to get the guns away they might explode; therefore we take them away behind the ambulances, and are no more wrong in doing so than you are in putting rifles inside of them."

Frequently during the late war I have seen ambulances deliberately shelled and fired on, and discussing the matter with the Boers in the earlier stages of the war, their argument was, "If a man is wounded he is our prisoner, and his rifle and

ammunition are ours. You may come out to attend him, and at ranges at which we can see we will not fire on you deliberately. On the other hand, if you come out to take him and his rifle away in a waggon, we hold that we are justified in firing on you. We never asked you to come, so you do so at your own risk." This remark also applied to ambulance parties and ambulance waggons going in the vicinity of Boer positions without permission from them. In answer to my question, "Don't you try and get your wounded away as best you can?" I received the rather galling answer, "Yes, but we don't raise a storm in the papers when we are fired on in so doing."

These, then, are some of the practical faults I have myself experienced in the Geneva Convention as it is, and I now come to a possibility which may occur in the present style of warfare.

Assume a position, of an isolated nature, and where there are transport and supply difficulties, is held by a force A. An attacking force B loses 400 seriously wounded men in a reconnaissance in force and retires to its own outposts, leaving these wounded behind. The next day the general of force B decides to attack and the general of force A decides to retire. Article VI. of the Convention says "that the wounded can be returned with the consent of both parties," but there is no confirming authority as to who should take them. Force B does not want the wounded as they would impede his movements. Force A does not want them for the same reason. In practice, we would find that force A would leave them and force B would be obliged to take them over. Therefore, Article VI. becomes valueless, for the simple reason that there is no definite ruling, matters are left to both sides, with no one to decide. *May* and *can* are used instead of *shall* and *will*, except in the opening paragraph, where it says, "Wounded or sick soldiers *shall* be entertained and taken care of to whatever nation they belong." Even this paragraph is ambiguous, as medical attendance is not alluded to, and an enemy of the nature of the Boers may content themselves by protecting the wounded from violence and entertain them by banjo playing or scripture reading.

It may be considered that I am vindictively inclined towards our late adversaries, but it is not my intention to be so. I consider that they have seen for themselves the fallacy of the Geneva Convention and only abide by one rule, that is, to look after any wounded that may be left on their hands, friend or foe. I have

frequently seen cases where they deliberately fired on an ambulance and drove it back, yet in contrast to this conduct, were as kind as kind could be to the wounded man himself when captured, and to the medical officer when he entered their lines with permission.

I hope that every officer will agree with me when I say that at the present long ranges it is absolutely impossible to see any distinctive flag.

That heavy guns firing explosive shells are directly at variance with the idea of marking an hospital with a Geneva flag, as fragments of bursting shell go in all directions.

That a howitzer battery firing from behind a hill cannot be held responsible for bursting shells in an hospital or church.

That it is ridiculous to suppose that a squadron of cavalry should not be fired on in retiring, because an ambulance happened to follow in the rear or stop to pick up a wounded man.

That a force could not be expected to stop firing because an ambulance with the enemy's advancing infantry came some miles in front of their own heavy artillery.

That in a night attack it would be impossible to tell where an hospital was, or to pay any attention to it whatever.

That it would be infinitely better for all concerned to have an up-to-date convention in keeping with the times.

It is possible for my readers to presume that I advocate leaving all wounded on the field of battle to be captured by the enemy, thereby increasing the list of prisoners and also losing men who may be able to resume their duty in a few days, but this is not my intention. From practical experience, however, I consider that men might be trained to get back when injured better than they do : war always has been war, and so it will continue to be. I do not for an instant dispute the fact that a man wounded in the arm would have greater chances of quick recovery if attended to at once, but because he would be better off still, if injured, while lying in bed, no one would advocate that he should bring his bed with him. The best thing he can do, or a medical officer can do for him, is to drag him under cover somewhere ; the treatment of his wound as compared with his life must be a secondary consideration. There are also occasions where it is madness to send ambulances accompanied by men walking about in the open ; for instance, in a position under heavy rifle and maxim fire at from 800 to 1,200

yards, and artillery fire at longer ranges. When every combatant engaged is lying behind cover, medical assistance can only be rendered by crawling about from wounded to wounded.

At the battle of Talana Hill, the 18th British Field Hospital, having just arrived from India, the rank and file knew nothing about the Geneva Convention and all Europeans were armed with modern rifles. With a certain number of casualities, all the wounded were got in without any complaints on the part of the bearers. In reality, without a convention medical units would be much safer, as they would then retire with the force and never be expected to render assistance unless there was a body of troops between them and the opposing force. They would not be expected to go into the enemy's lines without permission; they would not be sent marching about a hostile country without any armed protection; and they would not be dispatched at night with lanterns, with orders to go right up to the enemy's positions and outposts to search for wounded.

As regards proposals for reconstruction, my suggestions are as follows :—

(1) A definite and unmistakable ruling to the effect that both sides of opposing forces are responsible for the treatment of any wounded or sick who may come into their hands.

(2) A definite ruling as to what is to become of the wounded, whether they are to be retained or returned to their own outposts. The present wording of Article VI. is too vague, *shall* and *must* should replace *can* and *may*. Without any convention the commander of a force can do any humane action he wishes, even to giving his wounded enemies pipes, tobacco and a plum pudding at Christmas time.

(3) Removal of the ambiguity of Articles I. and IV., regarding the liability of military hospitals to the laws of war.

(4) A definition of what is and what is not an ambulance.

(5) Some characteristic badge showing the difference between rank and file, and officers of each ambulance corps, with an agreement that if taken unarmed or armed only with a revolver (see paragraph 6) they should be allowed to return to their own outposts.

Instead of a badge, a certificate from the general officer commanding each force would suffice. The present brassard, which can be made in five minutes, hidden on the person and used when

the rifle is discarded, has been and will continue to be used by spies and all sorts and conditions of men. I have frequently seen generals in a dilemma as to what they should do with this variety of prisoners, knowing them to be imposters; they were obliged to let them return on account of a home-made brassard worn by them on the left arm. In wars of the future it will not necessarily be the braver force which will eventually be successful; there will always be an element of slimness, therefore the clearer and less liable to misconstruction the rules of an international convention are the better.

(6) An article authorising small arms being carried in ambulances to correspond to the number of wounded therein, and at the same time prohibiting guns of larger calibre being tied behind or to the waggons. Of course, it could be ruled that arms should not be carried, in which case extra transport and a corps for picking them up would be required by each force, otherwise they must fall into the hands of the enemy. The *personnel* of medical units should be allowed to be armed with revolvers for self-protection. In practice there are always the arms of patients, but if these are otherwise stored, as they should be under a convention, a military hospital unprotected by an escort is at the mercy of any armed vagabond and camp follower in the vicinity. Every man should be allowed to protect his own life, and in modern war, if only armed with a revolver, medical units would be of no possible use acting on the aggressive.

(7) An article prohibiting "hospitals" from the region of hostilities. All medical units which accompany troops in the field should be called ambulance corps, bearer companies, or some other suitable designation. Field hospitals should be renamed, in accordance with previously noted nomenclature.

(8) The white flag should protect all ambulances without an escort, moving from one place to another, provided they contain sick and wounded.

As regards medical arrangements in our own forces:—

(1) We should cultivate the idea of every man being his own doctor more than we do. In fact, all ranks should be taught how to apply the first field dressing, instead of limiting the number to four per company.

(2) Men should be taught to get away under cover when wounded, and when possible.

(3) Medical officers should wear some characteristic badge instead of a brassard—which is at present worn by all connected with a hospital—the clergyman, transport driver, storekeeper, and others devoid of a professional training.

(4) The safest and most central position in camps, at present devoted to guns, should be awarded to medical units, as is done in Indian warfare. The *personnel* of medical units should be taught entrenching, as, properly entrenched, the sick and wounded would be safer than under any particular banner. Commanders of forces may be as chivalrous as they wish towards medical units of opposing armies. The late General Joubert, in allowing our sick and wounded at Ladysmith to be sent to Intombi Camp, did so on the grounds of humanity and not in accordance with any convention.

My suggestions are for the welfare of the helpless and their best possible protection, therefore I suggest a reconstruction of the present Geneva Convention, so that it should be in keeping with present modes of warfare. It should be understood and religiously complied with by both belligerents, as at present the ethics of the convention are nothing more or less than a tacit international agreement to do what is impossible, impracticable and unreasonable.

HONG KONG.

By Major S. F. CLARK, R.A.M.C.

As my experience of this Station lasted from 1897 to 1903, it has been both recent and fairly extensive.

General Description.—The colony includes not only the island of Hong Kong proper, but a part of the adjacent mainland of China, known as Kowloon, and in 1899 the British leased from the Chinese Government some 400 square miles of the Kowloon hinterland, which is spoken of as the New Territory. The water dividing the island from the mainland forms the harbour, and ferry boats ply from side to side every few minutes, making Kowloon a suburb of the island.

Hong Kong itself is 10 miles long, by 8 at its widest part, and has a circumference of 26 miles. The island is practically a mountain with the main ridge running east and west, and subsidiary spurs branching out towards the south. On the north side of the main ridge is the harbour, and in the narrow space between it and the mountain lies the city of Victoria—the centre of the colony. To gain space much land here has been reclaimed from the sea, and buildings extend from some distance up the hillside; but the whole city is so cramped together between the mountain and the water that the density of the population is enormous, and plague easily obtains a footing in the insanitary surroundings of the Chinese quarter.

At the centre and eastern side of the city are the business premises, hotels, banks, government offices, &c., and here also are the barracks for European troops, and the Station hospital—both well away from the native town. In addition, some troops are quartered at Lyemun—at the eastern end of the island—and also at Stonecutter's Island, which is in the harbour.

The Peak.—The top of the mountain, known as the Peak, is connected with the city by a cable car, and in eight minutes one is carried up 1,500 feet from the roaring streets to the quietude of the higher levels. A strong detachment of European Infantry is kept up here, and most military officers, including the R.A.M.C., live there. For a married man it is absolutely essential to live at the Peak—especially if he has children—as in summer the climate there is comparatively cool and fresh, while the lower levels are seething with heat and discomfort. I desire to emphasise this point, as the sickness among medical officers and their families

was great when they were compelled to live in the city, while they now enjoy good health. The town is so placed that the Peak cuts it off from the prevailing wind in summer. The only climatic objection to the Peak are the fogs, which prevail in April and May, but are apt to appear at any time. They are not unhealthy, but are very depressing, and interfere with the ventilation of one's house. They make everything so damp that a drying room is a necessity. The scenery from the Peak is magnificent.

At Kowloon there is plenty of level ground, and the Indian troops (with the I.M.S.) are stationed there.

Geology.—The soil of the colony is mainly granite, much of it being disintegrated, and huge boulders lie about everywhere.

Vegetation.—Kowloon is bare and gaunt looking, but in Hong Kong the hillsides are covered with young trees and plants of every description. Many pleasant walks can be taken in the island, and for a good pedestrian the New Territory offers great attractions.

Climate varies in the different places. At the Peak it is always bearable in summer, and is quite crisp in winter, an occasional film of ice being sometimes visible in the mornings. In fact, if one had not to descend to the lower levels for work, it would be no hardship to live at the Peak, where the fog is really the main trouble. Children do well up here, but get very white down below.

In the city the summer is very trying. From May to September, both inclusive, the sun is strong—reaching 94° or so in July and August—and the humidity of the air is practically at saturation point. With the breeze cut off by the Peak the situation is thus by no means pleasant, and cases of heat apoplexy always occur at this time. The temperature averages 86° to 88° during these months, and the nights also are stiflingly hot. By the help of punkahs, electric fans, rickshaws and chairs, the work of the colony goes on. The summer is also the rainy and typhoon season, and these visitations luckily cool the air for some days. The rain is very heavy at times, but of late years droughts have prevailed. For the other seven months the climate is not unpleasant, and in December, January and February is quite cold, without reaching freezing point. The humidity of the air, however, is always considerable. This dampness of the air, especially foggy weather at the Peak, is very destructive to clothing, books, &c., and tin-lined boxes are essential. Ladies' garments require much care to preserve them from destruction.

Sport.—All tastes are catered for, as cricket, football, hockey, polo, racquets, tennis, golf, yacht racing, clay pigeon shooting, &c.,

are pursued with zest. An annual race-meeting is held, at which the chief event this year was carried off by one of our officers. Shooting—mainly snipe—can be had in the New Territory, but arrangements, in the way of hiring a launch and so on, have to be made to enjoy it. There is no big game. Except in Kowloon, the country is not suitable for riding or cycling, but still those possessing a bicycle should take it out with them. Carriages are practically unknown, their place being taken by chairs borne by coolies, and jinrickshas.

Accommodation.—The demand for houses so exceeds the supply that most officers who have not quarters live in hotels and boarding-houses. Since 1898 the housing question has become very acute, and only a well-paid or affluent officer can hope to have his own house. The boarding-houses arrange monthly terms. A scheme exists for building quarters for a Lieut.-Col. and three Captains R.A.M.C. at the New Station Hospital—a short way up the hill—but it will be long before they are ready. Rents and wages are high and show a constant tendency to increase. On the whole Hong Kong is an expensive station for a married officer, but a bachelor can do well. The pay is in sterling, and allowances are fairly good; they can be found in Allowance Regulations.

Clothing.—All English clothing and uniform should be taken, except a blue helmet. White and khaki helmets are used—the latter can be got locally very cheaply. Caps can be worn for several months, while overcoats and waterproofs are essential. In the winter one needs to be warmly clad, while summer uniform and clothing can be easily bought on the spot. There are good shops, and practically anything can be got in them, but still, ladies find a box from England very acceptable. There is plenty of social life in Hong Kong, so ladies should take a good supply of evening dresses, but silk linings will not stand the climate.

The civilian element in the colony is very strong, and the splendid club admits officers without payment of an entrance fee.

Servants.—Chinese servants are good on the whole, and the "amahs," or nurses, are trustworthy and careful of the children in their charge.

Sickness.—Practically all tropical diseases are met with, and plague is an annual visitor. Malaria of a severe type is common, but efforts are now being made to combat it.

Each year some of the R.A.M.C. officers are able to avoid part of the hot weather by going to Japan, but nobody cares to leave Hong Kong during the pleasant winter months. Taken all round, Hong Kong is a good station, *provided that one lives at the Peak.*

NOTES ON SOME CASES OF GUNSHOT INJURY TO THE FEMORAL ARTERY.

By Brevet Lieut.-Col. S. HICKSON.
Royal Army Medical Corps.

During the late war in South Africa wounds of the large blood-vessels were, comparatively speaking, not uncommon, and I think it will be found when the statistics of the war are completed that the proportion of wounds of vessels has risen considerably since the introduction of rifles of small calibre and high velocity. The following brief notes of four cases of wound of the femoral vessels which were treated in No. 11 General Hospital, Kimberley, will, I venture to hope, be of some interest.

In the first case, the bullet had passed between the artery and vein, causing an aneurismal varix. It was treated by ligature of both artery and vein above and below the seat of injury, and removal of the intervening portion of both vessels. An excellent recovery was made, and although both vessels were occluded the collateral circulation was quickly established. Cases 2, 3, and 4 were gunshot wounds of the femoral artery alone, leading to the usual condition of diffuse aneurismal hæmatoma. It will be seen that the operative treatment of each of these three cases was different, and I think there is no doubt that the direct method of incision with proximal and distal ligature and thorough removal of all clots is the proper procedure. But this is not always easy, the limb may be swollen to an immense size, the tissues infiltrated with blood, and the different structures almost unrecognisable. Under these circumstances proximal ligature is sometimes resorted to. This operation, *per se*, seems to me an undesirable proceeding, and it should, I think, always be accompanied by free incision of the pseudo-aneurismal sac and a thorough clearing out of all clots. If this be not done, and the clots are allowed to remain, they gradually consolidate and contract, and Case No. 3 shows the danger of leaving large coagula *in situ*, as gangrene no doubt resulted from the pressure exerted by fibrinous clots on the collateral circulation. In Case No. 4 all clots were freely removed, in addition to proximal ligature. The result was satisfactory.

Case 1.—J. D., a Boer prisoner of war, aged about 40, was admitted on May 9, 1900, suffering from the effects of a bullet wound of the left thigh received at Rooidam on April 5;

range unknown. The bullet was probably a Lee-Metford, and had entered the front of the thigh four inches above the patella, passed upwards and backwards and emerged three inches below the gluteal fold. The wounds were healed on his admission. About ten inches below Poupart's ligament, in the line of the femoral vessels, there was a rounded pulsating swelling, four and a half inches in diameter. The pulsation was expansile and was accompanied by a very distinct thrill, which could be traced upwards as far as Poupart's ligament, and downwards to the popliteal space. There was also a continuous rough murmur audible all along the course of the vessels, an excellent example of the "bee in a paper bag" sound. There was no œdema of leg. The patient was unable to walk without the assistance of a thick stick, he complained of weakness in the limb and shooting pains down the inner side of the leg as far as the ankle. The diagnosis of arterio-venous aneurism was made.

As for treatment, he was placed on calcium chloride in full doses three times a day, and kept at absolute rest in bed for three weeks without any effect. Afterwards, instrumental compression of the femoral artery was given a trial, but caused no improvement. His heart and arteries being apparently healthy, it was decided to operate, and on July 17 the vessels were exposed in Hunter's canal by the usual incision. On drawing the artery to one side it was seen that a communication existed between it and the vein, the latter vessel being considerably enlarged, and was pulsating visibly; but there was no proper sac. The artery and the vein were separately ligatured above and below the point of communication, and the intervening portion of each vessel, about one inch, removed. The incision was closed in the usual manner, without any drain, and the leg wrapped in cotton wool and elevated. No ill effects followed the operation, the wound healed rapidly, and there was neither loss of temperature in the limb nor œdema. He was discharged on September 22, 1900, able to walk without a stick, and apparently suffering no inconvenience.

Case 2.—Boer prisoner, W. P. van A., aged 32, admitted May 9, 1900, for bullet wound of right thigh. Like the previous case, he was wounded at Rooidam, on April 5, projectile Lee-Metford bullet, range unknown. Condition on admission: The entrance wound was in front of the thigh over the first part of Hunter's canal, and the exit wound at a slightly lower level behind; the thigh was very much swollen and a tense pulsating tumour existed in the region of the injury. The tumour was diffuse in character and painful, pulsation ceased on compression of the

main vessels at Poupart's ligament, a rough systolic bruit was present; no pulse could be felt below the level of the knee. There was no œdema. The tumour gradually increased in size, and pain, shooting down the leg, became more constant. On May 12 an incision about four inches in length was made over the line of the artery in the upper portion of Hunter's canal. Beneath the fascia the intermuscular planes were found extensively infiltrated with blood clot. On the clot being cleared out and the femoral vessels exposed in the canal, a punctured wound was found in the femoral artery, the vein being uninjured. The artery was ligatured above and below the wound and divided between the ligatures, the cavity irrigated with sterilised water, and the wound closed. There was never any loss of heat nor œdema in the leg after the operation. He made an excellent recovery, and was allowed up on June 1, and eventually handed over to the authorities as a prisoner of war.

CASE 3.—N., a native scout, was transferred to a British hospital, November 10, 1901, suffering from a gunshot wound of the right thigh, implicating the superficial femoral in Hunter's canal, and giving rise to diffuse traumatic aneurism. There was, I understand, a large effusion of blood into the tissues of the lower thigh. The treatment adopted was ligation of the artery in Scarpa's triangle. At first all went well, the wound healed rapidly, and collateral circulation was well established. But after a time signs arose indicating increasing pressure on the circulation from the effused blood. Deep ulcers, intractable to treatment, appeared in the leg; and when I first saw the case gangrene of the foot had set in, and the patient presented a wretched, emaciated appearance. I accordingly amputated in the middle of the thigh. On examination of the pseudo-sac, it was found completely filled by hard fibrinous coagulum, and the intermuscular planes around infiltrated with similar clots, firmly adherent to the surrounding tissues. The amputation healed quickly, and the patient made an excellent recovery.

CASE 4.—Lce.-Corpl. N. was admitted on March 1, 1902, he having been wounded at Klipdrift in the left thigh. The wound and resulting aneurism were exactly similar to those in Case 3, reported above. The aneurism, occupying Hunter's canal, was large and well defined; there was no sign of the vein being involved. The lower half of the thigh was greatly swollen and thickened, evidently caused by a large effusion of the blood. On March 28 I ligatured the superficial femoral at the apex of Scarpa's triangle,

kangaroo tendon being used, and closed the wound; then, by means of two free incisions, one in front through the aneurism and the other behind between the hamstrings, turned out a large amount of clot of varying consistence. Sharp hæmorrhage ensued from the posterior wound, presumably from the distal end of the artery; this was, however, easily controlled by packing with iodoform gauze. The anterior wound was closed. Forty-eight hours afterwards the packing was removed from the posterior wound, which was found to be quite dry; it was then closed. All the wounds healed perfectly and the patient made an uninterrupted recovery.

ELEMENTARY HYGIENE IN THE BARRACK ROOM.

By Major E. C. FREEMAN.
Royal Army Medical Corps.

The condition of the barrack room, which forms the soldiers' principal environment, is always important, but it is especially so just now when many new barracks are being built, and when there seems a tendency to waste public money over costly and impractical experiments, such as separate cubicles and the like, while simple and obvious improvements cannot be carried out "for lack of funds." The subject has been dealt with by many authorities as far as regards ventilation, cubic space, warming, drainage, &c.; these will not be touched on here, but there are various minor matters, perhaps of less fundamental importance, but still intimately affecting the life and well-being of the soldier, which are worth considering.

The term "barrack room" covers the accommodation provided for the soldier, whether it be in the newest red brick or in the oldest and dingiest of Georgian buildings, in the damp casemates of a fortress, or a galvanised iron hut on Salisbury Plain. Consequently we have to adapt our views to all sorts and conditions of buildings, many of them old and insanitary, but at present too costly to be rebuilt. One thing only is common to all, insecurity of tenure; men and officers come and go at short intervals as if they were emulating the wandering Jew, and this alone makes it difficult to get an intelligent interest taken or money expended in improving the condition of the soldiers' quarters. Commanding officers do not care to sanction expenditure on institutes, &c., when they are likely to have to pack up and move on in a few months, and the men also, feeling themselves but temporary tenants, do as little as possible to their rooms.

That barracks can be made attractive in appearance is shown at Portsmouth by the very handsome Victoria Barracks. That they are usually hideous is a fact obvious to every body. This point affects recruiting, for the boy who stares through the railings gets a bad impression of the service from a building grimmer and more forbidding than a gaol or workhouse. It also affects the soldier, who will more easily work to keep a place clean and sanitary when there is some tangible result to show for his trouble, instead of stone and wood-work so old that no cleansing produces

a visible effect. "As bare as a barrack room" is proverbial, and with the constantly changing population not much can be done to alter this, unless we imitate our astute German neighbours and hang up military axioms and records of victories upon the walls. Something of the kind would be very desirable, for there is no doubt that the constant contemplation of the bare white-washed walls tends to dull the observing faculty, which now-a-days is of such importance to the soldier. Ultimately, the condition of any barrack room, both moral and material, depends upon the non-commissioned officer who has charge of it; and if he is slack or careless, no one else will be able to get that room kept straight. It is therefore desirable that corporals before promotion to sergeant should gain some slight knowledge of hygiene—the barest outline, such as is taught in the board schools, would suffice to give them some idea how to look after their men.

The cubicle system, which originated with the Rowton houses, and has been advocated by many amiable humanitarians, must be condemned *in toto*. It renders proper ventilation, cleanliness, and supervision impossible, is enormously costly, and serves no useful purpose whatever. The average recruit has never been accustomed to solitude and dislikes it excessively; moreover, the cubicle system would do much to discourage the sense of comradeship in the barrack room which it is so desirable to foster. The gentleman private, to whom the cubicle would be a boon, might well be allowed to live out of barracks, like the corresponding class of conscripts in foreign armies. The existing barrack room is overcrowded, not perhaps as to cubic space per head, but certainly as to floor space. This is obvious when we notice how the men's cots stand nearly touching one another. Quite one-third of the beds should be removed so as to give more floor space. A hospital pattern bedside table might be issued to each man in which to keep his property, and two or three wooden chairs might supplement the present rough benches. A door-mat is also a necessity, not a luxury as it is at present rated by the authorities; it would save dirt being brought into the room, diminish the necessity for washing the floor, and so reduce dampness in the room and the diseases associated with it. Outside the room altogether a cupboard should be provided with a slate floor for mops, scrubbing brushes and pails. These are at present kept in a corner of the room, and being always damp, make the floor wet and cause the "sour smell" one so often notices in barrack rooms.

That atrocity the "long-handled scrubber" should be abolished.

The time-honoured system of sluicing down the room with bucketfuls of water, and then propelling the resulting mess out of the door and down the passage or stairs with the aid of these implements, has nothing to recommend it; it does not clean, it leaves the floor damp for days, while the water passes through the boards into the ground, or into the ceiling of the room underneath. The results in either case are objectionable, and the soldier must learn to scrub out his room on his hands, and knees, with soap and water and an ordinary scrubbing brush, as the sailor does. Those convenient articles, the dust-pan and brush, are not at present recognised in the Army or Navy, yet they are very labour-saving contrivances and could not fail to reduce the amount of floor washing required.

It is an urgent matter that the ventilators provided in the barrack rooms should be fixed so that the soldier cannot close them, and be out of his reach so that he cannot stuff them up. This he will do if possible, for his dread of fresh air, especially at night, is intense. It would be a good thing to adopt the system of placing a board at the bottom of every window frame, so that the lower sash can never be shut down, but must overlap the upper one. The guard-room is even worse in the matter of ventilation than the barrack, and it is the foul atmosphere within rather than the cold without which is responsible for the sentries' pneumonia. We might here note that the "plank bed," which is reserved in gaols for the punishment of refractory criminals, has heretofore been the portion of the soldier every time he goes on guard—which may be every third or fourth day—as well as the whole time he is a "guard-room prisoner." Pipe clay, which is to a considerable extent responsible for the dusty atmosphere of the barrack room, will doubtless some day become extinct with other ancient military customs.

The connection between gas-jets and contagious disease has not perhaps been previously pointed out, though it is a very real one. The gas in a barrack room is, as a rule, darkness visible; many a man would stay in and read his book or newspaper, or write a letter, if he could only see to do so; but finding that impossible, he goes out into town and so into trouble. Something can be accomplished by seeing that the gas-jets are renewed at proper intervals; but it should be possible to obtain incandescent burners, as the cost is not prohibitive. In the most modern barracks electric light has been installed, but even then by using incandescent lamps of bad pattern, or too few of them, it is quite possible to get ill-lighted rooms.

It would be of great advantage if dining rooms were instituted in all barracks, so that the men need not feed, live and sleep in one room. This has been often advocated, and possibly the recent investigations into the spread of enteric fever by clothing, &c., will hasten the action of the authorities in this direction. In India the verandahs are used for this purpose, and at home the men may be seen, of their own choice, dining outside their rooms in any shady spot they can find. The provision of dining rooms would make the barrack rooms healthier, and would also lead to improvement in the food, which at present suffers from being broken up into small portions for the different messes, so that there is a good deal of waste. The soldier's dietary is excellent in theory, but is upset in practice by the capriciousness of the men, and by beer. The former might be met by a greater variety in cooking, and especially by the issue of butter or jam to diminish the terrible waste of bread which at present takes place. In respect of beer, the great evil is the opening of the canteen before meals. The soldier, possibly tired and thirsty, drinks beer on an empty stomach until, when the dinner hour arrives, his appetite has vanished. If regular dining rooms were provided, it would be quite easy for a man to be allowed his pint of beer with his dinner, and this would probably conduce to sobriety. The official tea hour is half-past four, and after this somewhat slender meal there is nothing else until next morning's breakfast. The writer's experience is that the only way to fill this gap is by giving facilities to the men for purchasing suppers at the regimental institute. Men, as a rule, like to do this, whereas an official issue of soup, after the novelty has worn off, soon loses its attractions. Moreover, a late meal keeps the cooks and orderly men late at work, and those who wish to go out of barracks for the evening will not wait for it. There is no reason why a man should not be able to get at least as good a meal at his own regimental institute as at any coffee shop or supper room in the town. Military tea is still made on prehistoric lines, and is weak, sweet and nasty; but until each mess has its own tea-pot (which is not at present contemplated), it is difficult to suggest a remedy. An earthenware mug has lately been sanctioned as an alternative to the bowl at present used, but the price is quite prohibitive. It would be a good thing to issue a mug for tea or water to every man, as well as a salt-cellar, pepper and mustard-pot to each mess. For want of these the waste of salt and mustard is enormous. Some kind of covered tray to carry the men's dinners from the cook-house to the barrack room is also

essential—at present they are exposed to dust, rain and germs, arriving at best in a lukewarm condition.

The "wash-houses" are another adjunct to the barrack room which need attention. In the older barracks they are always stowed away in a dark corner, and in the darkest corner of the wash-house itself stands the black, depressing slate bath. It is now, however, possible for a man to get a hot bath in barracks; five years ago it was not. Much money has been unwisely spent in providing fixed wash-hand basins and brass taps. These are useless, as for some reason the plugs and chains at once disappear, and soon the taps also become *hors de combat.* A fixed shelf and movable tin basins are alone required; these basins will also supply the place of the fixed foot-baths which have been erected with much care and ingenuity, but are very seldom used. If the money these things cost had been spent in admitting air and light and enamelling the baths, the result would make for cleanliness. The cause of cleanliness might also be assisted by occasional sanitary lectures; and if the men were taught to keep their nails cut short there would be little need for chiropodists.

The condition of the regimental institute varies a good deal according to circumstances and the particular idiosyncrasy of the regiment. Ventilation is usually defective, and the arrangements for washing up and water supply in the temperance room are often capable of improvement. The system at present in vogue of making the liquor bar as unattractive as possible defeats its own object, as the men seek more comfortable quarters in the public-houses outside.

Regimental libraries should be carefully looked after by the authorities, and stocked with really good books, as *ennui* is only second to dirt as a predisposing cause to disease. Workshops have been started with the same excellent object, but men, as a rule, fight shy of them, feeling that it is the duty of the soldier to loaf and smoke when parades are done. Smoking, both in the Army and Navy, be it noted, is every day becoming more and more a matter of the consumption of large quantities of cheap cigarettes, and the effect of this upon the system, especially of the young soldier or recruit, is a matter for serious investigation. The only trades which seem to find favour with the soldier are gardening and hair-cutting (apart from the official occupations of tailoring and boot-making), and the former certainly makes for health and the latter for cleanliness.

These rather desultory notes have purposely not touched on the

more scientific side of hygiene, but rather on minor points where the comfort and probably the health of the soldier might be improved without any great expense, or any great alteration, in the existing order of things. More barrack rooms would certainly be required; but in most barracks there are rooms at present empty, and there is no reason why dining rooms should not be utilised for purposes of recreation after meals.

NOTES FROM SOMALILAND.

By Capt. S. de C. O'GRADY.
Royal Army Medical Corps.

The following notes are put together under the somewhat unique conditions of field service in Somaliland. They may be, possibly, of some interest to readers of our Journal, especially as they refer mainly to the art and practice of surgery among the Somalis, who in many ways are a very strange people with stranger manners and customs. The men are probably the most conceited of mankind, though what they have to be conceited about is not very apparent. As a rule they are ugly, even for blacks, and are skinny and of poor physique with little muscular development. On the other hand, their women are strong and well developed and, when young, plump and comely. The men do not work, the little work that has to be done, such as loading up camels, carrying water, &c., is done by the women, while the men lie under a tree looking on. The men are all armed with spears—one for throwing and one for stabbing; these weapons no doubt help to subdue the "weaker" sex.

I have met several Somalis who have had surgical operations performed on them by their friends. One case, a transport man at Bohotle, had had his leg amputated by the Somali method. He had been kicked by a camel, and from his description I concluded he had sustained a compound fracture of the tibia, which had suppurated. His friends, having assembled a "Punch" (meeting), decided that an amputation was necessary and proceeded to remove the leg by the following method: The patient was tied on the ground with ropes, his hands being secured behind his back, then the anæsthetist proceeded to deal him a heavy blow on the back of the head with a log of wood, which they say "make him sleep," and certainly would have the effect of rendering him insensible to pain. The operator next proceeded to cut off the leg with a spear head, rubbing in ashes and binding on leaves tightly to stop the bleeding. The patient did not regain consciousness for some hours after the operation was completed. When I saw the man at Bohotle he was well and going about on a crutch; the operation had produced a very pointed stump with a piece of bone protruding. The leg had been taken off six inches below the knee joint, evidently at the seat of fracture.

It is quite common to see men with very large scars on their heads; some of these are cases which have been operated on for depressed fracture. If a man gets a heavy blow on the head, and does not recover consciousness for some days, his friends do an operation exposing the bone and raising up the broken piece, quite appreciating the dangers of a depressed fragment. They do all their operations with spear heads.

Daughters are a source of great wealth to their fathers, for when a Somali marries he has to pay the parent in camels and goats a price, varying with the good looks and features of the girl—fifteen to thirty camels with some goats is an average price. Somalis draw a great distinction between married and unmarried women; the outward sign being the manner in which the hair is worn, thus, a virgin wearing the hair "down" and a married woman "up" on her head, while if she has had a child the hair is worn in a blue bag. A peculiar, and it would appear a very necessary, operation is performed on all Somali girls when they are three or four years old. This consists in sewing up the vagina; the labia majora are brought together by means of sutures, either of plaited horse hair or of sheep's tendon. I had an opportunity of verifying this not long ago; a girl from a neighbouring *karia*, or collection of huts, came in to our camp and complained that two Somali mounted infantrymen had assaulted her while minding her sheep; they both denied having touched her. I was requested to make an examination to clear up the matter. The condition was what one would be led to expect, namely, a partial occlusion of the vulva, the labia majora having grown together along their posterior half, the anterior portion being patent but showing small scars where the sutures had been. The day before the marriage ceremony a second operation is carried out, usually by a *midgan* or *mistri*, the stitches are cut through and all adhesions treated in a similar manner, the instrument used being the usual spear head. The unfortunate patients are said not infrequently to die as the result of this procedure.

A Somali usually carries a permanent medical history about with him, in many ways as useful as the authorised written sheet. Whenever he feels pain in any part of his body a hot spear head is immediately applied to the part, and should there be no relief in a day or so, the iron is again applied to the same spot. The result being that their bodies are covered with scars—some slight and showing that the pain had not been severe or of long duration, others consisting of regular keloid growths, sometimes raised half an inch above the skin. In one case, which I happened to observe

some days ago, the left side was covered with keloid and large scars which corresponded fairly accurately with the lower lobe of the left lung, and from the man's description I gathered that he had suffered from pneumonia involving the lower part of his left lung.

When Somalis have been on plain meat diet for any length of time they always bleed themselves; this they do by cutting the veins under the tongue. They, apparently, are not subject to any infectious diseases, and enteric is unknown amongst them. These notes are doubtless crude, but they afford an interesting insight into the present position of surgery among a far from uninteresting people.

SOME RECENT ABDOMINAL CASES TREATED IN THE ROYAL HERBERT HOSPITAL, WOOLWICH; WITH REMARKS.

By Lieut.-Col. H. R. WHITEHEAD.

Royal Army Medical Corps.

The following five consecutive cases of abdominal disease presenting themselves for treatment at this Hospital make an interesting series. It is often urged as a great objection to military service, that the Medical Officers of the Army have not sufficient opportunities of studying the ordinary diseases of every-day life, or of performing the usual operations of surgery. While we cannot claim that they see the enormous amount of practice to be met in one of the large metropolitan hospitals, I think the following cases, which occurred within the space of a few weeks in the the ordinary routine of this Hospital, demonstrate that there are opportunities for differential diagnosis, and also for surgical practice, in our military hospitals.

That surgical interference is now held to be indicated in an increasingly large number of abdominal cases is I think generally conceded, and the question when to open the abdomen, and when to refrain from doing so, is by no means an easy one to answer in every case. Certainly with our present knowledge and surgical methods, the operation for opening and exploring the abdomen in doubtful cases is not such a serious undertaking as it was formerly looked upon. For good to result, however, this operation must not be too long delayed. My experience leads me to believe that many more cases are lost either from not operating, or delaying too long, than from an over anxiety to operate.

Case 1.—Acute obstruction occurring in a case of malignant disease of the colon: laparotomy—death.

Sergeant W., aged 36, was admitted on March 31, 1902, complaining of vomiting which had lasted some days, and severe pain and colic. He stated that for the last eighteen months his bowels had not acted regularly, and he had suffered from dyspepsia and colic. At times he had constipation, at other times diarrhœa. No blood had been observed by him in his motions. He stated that he had suffered from three somewhat similar attacks previously. His appearance was very earthy and cachectic, and he looked like a man suffering from malignant disease. This Non-Commissioned Officer had been employed latterly as a clerk and was therefore

able to remain out of Hospital longer than he would otherwise have been able to. The acute symptoms had been present for some days before his admission. On admission the abdomen was a good deal distended and tympanitic all over. There was no great localised tenderness on pressure but the whole abdomen was painful to the touch. Colicky pains were referred to the umbilical region. He was vomiting at intervals, the vomit being sour and offensive, but not stercoraceous. Enemata were administered, with the result that a small quantity of fæcal matter came away, but the distension and vomiting were not relieved. He was unable to pass any flatus. It was evident that some acute intestinal obstruction, superadded to a chronic condition, had become established. The symptoms of obstruction becoming more marked, and no relief being obtained by other means, it was decided after consultation to open the abdomen and explore it. Malignant disease of some part of the greater bowel was diagnosed. The operation was performed by Lieut.-Col. Hickson, in charge of the surgical division. The abdomen was opened in the median line in the usual way. The intestines were found much inflamed and distended. On reaching the descending colon a tumour was found to occupy the lumen of the gut. The growth was adherent to the abdominal walls. In manipulating the gut a rent took place, which was at once closed by Lembert sutures. The intestine above the tumour was brought into the median wound and opened and stitched to the abdominal parietes. After the abdomen had been freely washed out, the external wound was closed. The patient, whose condition at the time of the operation was very bad, did not rally. The tumour was found to be an epitheliomatous growth, involving the entire circumference of the gut, and obstructing the lumen of the descending colon. Colloid degeneration of part of the tumour had taken place.

Remarks.—This case was not seen till an acute obstruction had become established on a chronic condition. The Sergeant being a clerk did not report sick till his condition was far advanced. Laparotomy was undertaken with a view of establishing the diagnosis, and if malignant disease was found, to afford relief by colotomy, if complete removal, or short circuiting, could not be carried out.

Case 2.—Malignant disease of the rectum: inguinal colotomy—temporary relief.

Private W. P., aged 20, was invalided home from Bermuda on March 19, 1903, with the following history. For the last nine

months he had suffered from diarrhœa and uneasiness in the abdomen. He had pain in the left iliac fossa, where a hard mass could be felt. Examination by the rectum revealed a well-marked stricture about 3½ inches from the anus, which admitted the tip of the index-finger with difficulty. There was no history of syphilis or of dysentery. The stricture was annular in shape, hard and resisting. He had an evening rise of temperature of about one degree.

He was admitted to the Royal Herbert Hospital on April 27, 1903, on his arrival as an invalid from Bermuda. He gave a long history of uneasiness in the abdomen and diarrhœa. No blood had been noticed in the stools, but slime had occasionally been present. He had arrived at Bermuda in January, 1903; two days after he landed he had a severe attack of colic and was admitted to the hospital, where the stricture of the rectum was discovered. On his admission to the Royal Herbert Hospital he was emaciated and weak. The abdomen was distended and dull on percussion in the left iliac fossa. A hard mass could be distinctly felt in this position. On May 5 he was examined while under the influence of an anæsthetic. A hard tumour was found completely encircling the gut about 3 inches from the anus. The tip of the index-finger was only just admitted, and it was impossible to pass the finger through the stricture, and thus to find out its extent. He experienced great difficulty in passing his motions, and several sub-acute attacks of obstruction had occurred; it was therefore decided to perform inguinal colotomy. This was done by Lieut.-Col. Hickson on May 29, the gut was fixed to the abdominal walls, and opened some days later. He obtained a good deal of temporary relief, but the growth increased rapidly and he died on July 21.

Post-mortem examination showed that the growth involved the whole of the circumference of the rectum, starting 3½ inches above the anus. Capt. Lawson, R.A.M.C., the pathologist, reported that the growth was a columnar epithelioma, which had in places undergone marked colloid changes, and also mucoid degeneration.

Remarks.—The patient was rather young for this form of disease. The advisability of performing a Kraske's operation for complete removal of the rectum was discussed; but the advanced nature of the disease did not hold out any prospect of success, and inguinal colotomy was simply performed as a palliative measure. Lumbar colotomy would probably have been a better operation, as the growth was very close to the artificial anus in the inguinal operation.

CASE 3.—Intestinal obstruction, probably functional and resulting from paralysis of the small intestine: recovery.

Lieut. K., R.H.A., aged 22, was admitted to Hospital May 29, 1903. He gave the following history of his attack: On Sunday, May 24, he went up the river with some friends, and had lunch and dinner at riverside Hotels. The next morning he was seized with severe colic, he took a dose of castor oil and opium. That evening and the next morning his bowels were freely opened. He was staying in London, but as his leave was up he returned to Woolwich on Tuesday, May 26. Early the next morning he was again attacked by very severe colic, and took another dose of castor oil and opium, after which his bowels were opened very freely, but the pain remained constant. The pain was general over the abdomen, and he vomited at intervals. The abdomen became considerably distended, and was painful on pressure; he also had some rise of temperature. I saw him on May 29, he seemed very ill and I ordered his removal to the Hospital. For the next few days his condition was serious, he had considerable abdominal pain and distension, and vomited every two or three hours. The distension of the abdomen was uniform, and there was a good deal of abdominal pain, chiefly referred to the umbilical region. No action of the bowels took place after May 27 and he was unable to pass flatus. On May 30 hiccough occurred. The temperature was now normal, but the patient was very weak and feeble with a quick pulse, and his condition very serious. On June 3 the vomit was distinctly stercoraceous. He was being fed nearly entirely by nutritive enemata. On June 6 he passed a considerable amount of flatus by the rectum. After this the vomiting ceased, and the abdomen became more flaccid, and on June 3 the bowels were opened naturally, and the vomiting and other symptoms disappeared. From this date he slowly but steadily recovered.

Remarks.—This was an exceedingly interesting case. The question arose as to the cause of these symptoms, and whether the case was one of acute obstruction requiring operation. The presence of stercoraceous vomiting at one time seemed to favour this view, but the onset of the case, with diarrhœa and purging, appeared rather to negative it. Probably some acute enteritis, either from purgatives or ptomaine poisoning, was present, and paralysis of some portion of the small intestine took place. I had the advantage of the opinions of Dr. Allchin and Dr. Tunnicliffe in this case.

CASE 4.—Acute inflammation of the liver and spleen, with general peritonitis, due to malaria: death.

Pte. A. R., R.G.A., was admitted on June 4, 1903, as an invalid

from Hong Kong, suffering from ague. While in Hong Kong he was admitted to Hospital thirteen times with this disease. His last attack of ague there was a very severe one, evidently a form of "pernicious malaria." It was noticed that he had malignant parasites in his blood. The spleen and liver were enlarged, and he had suffered from hæmatemesis. On his admission to the Royal Herbert Hospital, he was suffering from marked malarial cachexia and was very feeble and weak, but stated that he had considerably improved on the voyage home. On examination, both liver and spleen were found much enlarged and tender to the touch. On June 20 he had a sudden and sharp rise of temperature in the evening, he complained of abdominal pain, which was general, but rather more marked in the right iliac fossa, and hepatic and splenic areas. The abdomen was distended and tympanitic. The next day, June 21, the pain was less, but he commenced vomiting, his bowels were opened and his urine, on examination, showed a trace of albumen. On June 24 the abdominal pain was much less and the vomiting had ceased, the abdomen was still distended, however, and tympanitic. His temperature was lower, and the patient seemed better. The tongue was clean and the bowels open. On June 27 the vomiting commenced again, and his temperature rose. The abdominal pain was not so marked, and was more localised over the hepatic region, but the abdomen was considerably distended. On examining his blood Capt. Lawson found malignant quotidian parasites and crescents. There was no leucocytosis. On July 1 the vomiting was incessant, the patient became very exhausted and died the next day.

On *post-mortem* examination the abdominal cavity was found in a condition of acute septic peritonitis, with thick greenish flakes of pus scattered all over the intestines, which were matted together. The liver was also thickly covered with similar flakes, and its surface was intensely congested. The coils of the intestine were separated with great difficulty. The vermiform appendix was normal, but bound down to the cæcum. No perforation of the intestines was present. The liver and spleen were both much enlarged. On hardening and cutting section of the liver, Capt. Lawson found a condition of profuse pericellular inflammation, and made the following remarks on the case: "Pericellular cirrhosis of the liver is now becoming a recognised sequel of prolonged exposure to malarial infection, especially the pernicious type. I think the condition is due to the irritating nature of the yellow pigment, most probably manufactured in the spleen, and not, as usually supposed, to repeated attacks of congestion."

Remarks.—In this case the onset of acute septic peritonitis was considerably masked by the other symptoms. Had the condition been thoroughly recognised, drainage and irrigation might have held out some prospect of success. The condition, however, appeared one of acute inflammation of the liver and spleen, so often associated in old-standing cases of malarial poisoning.

CASE 5.—Intraperitoneal abscess, peritonitis—laparotomy and drainage: recovery.

Driver J. M., R.F.A., aged 29, a local case, was admitted to the Hospital on June 19, 1903, suffering from perforation of the membrana tympani and a purulent discharge from the right ear. On June 29, while under treatment for the above condition, he began to complain of pain in the abdomen, principally referred to the left iliac region. On palpation there was a distinct feeling of hardness and resistance in this region. The bowels were open, but the motions were scanty. He had suffered from dysentery some months before, and occasionally had blood and slime in his motions. He began to have constant fever, and vomited at times. The abdomen became distended, and the hardness and tenderness remained in the left iliac region. On July 3 the symptoms were more pronounced. He had a temperature of 101° in the morning, his tongue was moist but thickly furred, and his abdomen considerably distended. The diaphragm did not move much on respiration, and the abdominal walls were hard and rigid. He now complained of considerable pain over the whole abdomen. On percussion the upper part of the abdomen was tympanitic, but marked dulness existed two inches below the umbilicus and extended right across the abdomen. On July 4 he seemed better, the bowels were opened three times, and he passed a good deal of flatus, but chiefly by the mouth. There was less tenderness and more confined to the left iliac region. His blood was examined by Capt. Lawson, R.A.M.C., and marked leucocytosis found. It was evident that the case was one of acute peritonitis. The abdomen became more distended, and the fever and vomiting continued. On examination *per rectum* the finger could feel high up a hard resisting mass, which was situated in front of the finger and to the left side, and was acutely painful. The abdomen was now very distended and painful, the vomiting became more frequent, and the patient's condition was very grave. On examination of the urine, albumen and epithelial casts were found present.

On July 8 I decided to open the abdomen and explore it, and to wash it out and drain, if necessary. The usual incision in the

middle line was made between the umbilicus and the pubes. On opening the peritoneal cavity a quantity of thin purulent fluid escaped. The fluid had a very fæcal odour, and contained numerous flakes of yellowish lymph. The coils of the intestine were reddened and covered with shreds of lymph and were much matted together. The cæcum and appendix were examined and found normal. The upper part of the abdomen was not affected and was shut off by adhesions. On examining the abdomen towards the descending colon a collection of very offensive thick yellow pus was discovered. In this region there was considerable matting of the intestine, and the surface of the large gut was covered with lymph. The abdomen was thoroughly washed out with warm sterilised saline solution. No perforation was discovered, and it was thought undesirable to disturb the intestines to any great extent. A drainage tube was passed well down into Douglas' pouch and the abdominal wound closed. The patient was rather collapsed during the operation, but rallied well under the usual remedies. For the first few days the discharge continued very fæcal in odour and very profuse. The dressings had to be repeatedly renewed. Gradually the discharge lost its fæcal smell and became less. For several days after the operation the temperature remained above the normal, but this gradually fell and the wound was completely healed by August 16.

Remarks.—The case was evidently one of localised abscess about the descending colon, with peritonitis of the lower part of the peritoneal cavity. The origin of the abscess seems doubtful. The patient had chronic kidney disease, but there was nothing to point to the abscess being connected with the kidney or ureter. The man was suffering on admission from subacute dysentery, and possibly the abscess was caused from a dysenteric ulcer as the starting point.

WHAT EVIDENCE CAN BE ADDUCED AS TO THE CONVEYANCE OF DIPHTHERIA INFECTION FROM THE LOWER ANIMALS?

BY MAJOR F. SMITH, D.S.O.
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FIRST written in 1897, the monograph from which the following extracts are derived was not published owing to the author's continued absence on service. Some three-quarters of the work have been cut out for the purposes of this paper. The original dealt also with the historical and clinical aspects of the disease, the morbid anatomy and pathology, as well as with the bacteriology and the preparation of antitoxin. As far as necessary the subject-matter has been altered to bring it up to date.

RÔLE OF THE BACILLUS.

Before proceeding further, it is well to state that I take it for granted that the Klebs-Löffler bacillus is an essential agent in the production of diphtheria.

Of late years, owing to the discovery of the bacillus, the tendency has been rather to ignore other possible etiological factors. But until we know more about the natural history of this bacillus we shall not be justified in disregarding the knowledge which has come to us empirically in pre-bacteriological times. Certain it seems, if we do away with the bacillus we do away with diphtheria. To a limited extent, however, the writer is inclined to look upon the presence of the pathogenic bacillus, as evidenced by the prevalence of the disease, as an indication that the subjects of the disease have been exposed in some way to the influence of unhealthy conditions other than the mere presence of the micro-organism.

It is doubtful if any but exceptionally virulent bacilli in large quantities are capable of setting up diphtherial disease in a healthy mucous membrane. Probably the usual course of events is as follows: An abrasion or diseased condition of the parts enables the bacilli to exist and eventually to destroy the surface covering. Poisonous products of the bacilli begin to be absorbed at once, a local inflammation and swelling of the tissues is set up, the tissue cells degenerate, the walls of the minute blood-vessels undergo changes and allow the blood elements to exude into the surrounding tissues and on to the surface of the mucous membrane, where

they form a coagulum of fibrin in which are embedded numbers of leucocytes and epithelial cells. On this coagulum the bacilli grow vigorously and rapidly multiply, producing their toxins in such increasing quantities that the system into which they are absorbed is quickly poisoned and the symptoms of diphtheria are produced. The coagulum may be regarded as dead material, and this would argue that the bacillus is largely saprophytic. Like the tetanus bacillus it is unable to exist in the healthy organs without some mechanical or chemical protection from its enemies the phagocytes, but when once it gets a good start it is able to keep the white cells at bay and may finally overcome them completely. The leucocytes which swarm to the seat of infection, and thus come well within range of the bacillary toxins at the place of production, where the poison is most concentrated, are destroyed, and help to increase the pabulum on which the microbe flourishes so well; the process continues until such time as the infected organism has either succumbed or has reacted to the poison in such a manner that it has produced antitoxic material or increased its own antitoxic powers to sufficient extent to neutralise the toxins; the process then ceases, the coagulum sloughs away, and the bacilli die off. So then the coagulum may be looked upon as the result of an effort of the organism to resist the bacilli. Regarding it in this light, the presence of so many leucocytes in and about the membrane may be interpreted as due to the cells having hurried to the point of entry of the poison in the endeavour to repel the invader, and having died at their post, so to speak. In those cases in which death has resulted without the formation of membrane, it may be imagined in spite of, or as an alternative to, the suggestion that the bacilli rarely, if ever, kill before membrane is produced, that the leucocytes were put out of action before they could make any attempt to oppose a barrier to the enemy's advance.

We want to know whence the bacillus, the conditions favouring its pathogenicity, and the modes of propagation of the malady with which it is concerned. How little we *do* know about these matters will appear in the following pages.

Milk Infection and Diphtheria in the Lower Animals.

It seems to have been long ago believed that animals sometimes contracted diphtheria from human beings. In the 1845 edition of the "Army Medical Museum Catalogue" I find the following: "Trachea of a fowl almost closed by false membrane. The bird died of a disease which resembled croup.—Mr. Shower."

In 1860, in a report of the medical officer of the Privy Council, Dr. Sanderson related how three *pigs*, living on a piece of ground where diphtheria discharges were thrown, quickly died with symptoms of diphtheria.

In 1872 Professor Bossi reported the death of a *greyhound* from supposed diphtheria.

Oertel, Trendelenburg, Hueter, Tommasi, Nassiloff and Eberth are said to have inoculated *rabbits* on the cornea, trachea, &c., with diphtheritic membrane, and thus brought about fatal results. G. S. Buchannan, *Local Government Board Report*, March 9, 1898, refers to animal and *bird* diphtheria, and mentions an illness among rabbits in the backyards of houses invaded by diphtheria. A. M. Erskine, at Goole (*Brit. Med. Journ.*, Feb., 1902), is suspicious of domestic animals and birds, and says Dr. Cammidge found the diphtheria bacillus in a rabbit. There is not much given in the way of detail about this animal's illness, or about any tests which may have been applied to prove the genuineness of the bacillus.

In 1885 Dr. C. J. Renshaw ascribed the death of some *cats* to their having eaten diphtheritic membrane. Further instances were soon adduced. Mr. George Turner, in 1886, in a Local Government Board Report, attributed the illness of a cat to its having been fed on the refuse from the table of some children suffering from diphtheria. Jacobs made *post-mortem* examinations of three kittens which died in a diphtheria-invaded house, and found diphtheritic membranes, he said, in their throats. In 1888, Dr. Bruce Low reported to the Local Government Board to the effect that at Enfield a cat contracted the disease from a child and gave it to another child. Dr. A. Downes, M.O.H., Chelmsford, is quoted by Klein, as follows: "Frank A., aged 6, and his sister Catherine, aged 5, were attacked by diphtheria simultaneously on January 14. Shortly before the children sickened their favourite cat, which they were in the habit of fondling, fell ill, lost its voice, had a husky cough attended by choking, and was observed to make efforts to clear its throat with its paws. . . . Last year in my Chelmsford district a cat died with symptoms strongly resembling diphtheria, which commenced a day or two after she had licked the vomit of a child ill with diphtheria." He next quotes from a letter he received from Dr. Shirley Murphy, regarding diphtheria at Camden Town: "A family has had two cases of diphtheria following the illness of two cats in the house. . . . The illness of the cats led to swelling of their throats and interference with their respiration." Mr. Daniel, veterinary surgery,

who attended the cats, regarded the malady as an infectious one not uncommon among cats in his neighbourhood, and he had at the time several bad cases under treatment. He said that the disease began with swelling and congestion of the throat, together with respiratory difficulties; and that in some cats the illness tends to a prolonged pulmonary disease, in the course of which the animals become thin and die. He afterwards sent one dead and one sick cat to Dr. Klein. Dr. Thursfield also sent Dr. Klein the body of a cat which had died in a house in which there was diphtheria. The results of the examination of the cats are given further on.

The fact that diphtheria was at the time a disease specially affecting rural communities had already caused a suspicion that it might be in some way concerned with domestic animals. But it was the announcement of the discovery by Dr. W. H. Power in 1878, in North London, of the agency of milk in the spread of diphtheria, which gave the greatest impetus to enquiry in this direction. The epidemic lasted from March 9 to June 15; 230 cases, with thirty deaths, mostly in Kilburn and St. John's Wood.

By a process of exclusion it was surmised that the cows themselves contaminated the milk, but no disease appears to have been recognised among the cows. From this onwards, milk epidemics were reported from time to time. Dr. Power reported also on an outbreak at Hendon in 1883. Attention was called to the milk by the inhabitants complaining of its ropiness. At Finchley there were a few customers of this dairy and they also were attacked by diphtheria.

In some of the reported "milk epidemics" the cows were found to have chapped or ulcerated teats; in others such was not the case, and in some the milk was thought to have been infected by human beings who were suffering from diphtheria. Of some twenty outbreaks ascribed to milk agency in one form or another, the essence of the proof is that the proportion of houses invaded among houses supplied is greater in the case of the suspected milk than of other milk supplies. For this kind of evidence to be of much value it must be shown that there was a good number of houses supplied from other than the suspected source, and that the two groups of houses should be mixed up a good deal. Obviously, if one dairy supplied nearly all the houses in a given area a special incidence of disease in those houses need not necessarily be due to the milk.

The investigators have been skilled men (Local Government Board Inspectors and Medical Officers of Health), and after making

due allowance for the tendency to fashion in medicine, under the influence of which an endeavour seems to have been made to trace every outbreak to milk, it must be admitted that they have made out a fairly good case against that article of diet. The twenty reports have been selected from among a great many because they bear evidence of painstaking effort to get at the truth. A good many instances in which the assumption that milk influence was at work appeared to be scarcely warranted by the facts adduced have been left out. The inferential evidence has been placed on a scientific basis to some extent by the arduous researches of Dr. Klein, and also by some experiments of other workers in the same field. We shall see that they have shown that at least one of the lower animals suffers from a disease either identical with or akin to diphtheria; and that there is some ground for believing that cows when infected artificially with diphtheria, excrete Klebs-Löffler bacilli with their milk.

Diphtheria of Cows—Kleins Cow's—Experiments Inconclusive.

Mention has been made of the fact that some few suspected cows were found to have scabs or ulcers on the teats. The animals, however, were not suffering from any recognised complaint which would be serious enough to call for the services of the veterinary surgeon, indeed, in most cases they were said to be quite well, the teat affection having been in some cases unnoticed, while in others it had been casually remarked, but was not considered worth mentioning. I shall analyse Klein's experiments in some detail, because it seems to me that his conclusions have been taken on trust by a large section of the medical public, oblivious of the dairyman's interest.

Klein inoculated apparently healthy and clean milch cows (1 and 2) under the skin with a Pravaz syringe full of three-day-old diphtheria from a human source. Each cow had a slight rise of temperature on the second day, but on the fourth day both temperatures were normal. By the third day a tumour had formed at site of injection. On the fourth day No. 2 cow had a small vesicle on one teat and similar vesicles on the udder near it. On the fifth day the vesicle on the teat was covered with a thin brown crust and under the finger seemed to be an indurated nodule; about a dozen vesicles were found on the hind-part of the udder, some full of clear lymph, some purulent, and others covered with brown crusts, all slightly raised on a lightly injected corium. On

removing a crust a purulent ulcer was exposed. The ulcers varied from one-eighth to half inch in diameter. On the sixth day there were fresh crops of vesicles and those of yesterday were crusted. Crusts and scrapings from vesicles were taken for future experiment. The cow was noticed to have a slight cough. Cow No. 1 had only four sores of the same character and she had no fresh crops. No. 2 had new crops up to the eighth day. On the tenth day No. 2 had no new vesicles, but in both cows the sores were smaller, drying up and healing. Both animals were apparently well and giving abundant milk. In the lymph of the vesicles and pustules the *Bacillus diphtheriæ* could be demonstrated unmistakably in cover-glass specimens and by culture. The sores were thought to correspond with the chapped and scabbed teats so frequently mentioned, and their rapid disappearance was held to explain why suspected cows were so often found in good health. Of some milk taken aseptically from No. 2 cow on the fifth day after inoculation one drop was rubbed over the surface of four gelatine tubes. On the third day a growth appeared in three and was conspicuous by the fifth day; the other tube remained sterile. In one of the three tubes there were two colonies and in the others three each. All the eight colonies were of the same kind and there were no other organisms in the tubes. By microscopic examination and by sub-cultures all were proved to be unmistakably colonies of the *Bacillus diphtheriæ*, and they were indistinguishable from those found in human diphtheria.

To finish the history of the cows: On the thirteenth day No. 1 was very ill, was getting thin and breathed quickly; the following night it died. No. 2 cow was then apparently well; it, too, however, became ill, cough got worse, breathing was rapid, it ceased feeding and ruminating. On the twenty-fifth day it was killed.

Post-mortem appearances of both cows were similar. A firm tumour at site of puncture involving subcutaneous and muscular tissue; the tumour showed necrotic white septa or laminæ. Lymph glands in neighbourhood enlarged and petechial. Lungs congested and parts consolidated. Petechiæ in pleuræ. Brown necrotic patches in the liver. Hæmorrhagic spots on visceral pericardium. Kidneys congested. Pure cultures of diphtheria bacilli were obtained from the tumours. Sections of the tumours showed that the necrotic white septa contained aggregations of diphtheria bacilli, some of which had become threads with spherical buds or swellings at intervals. Similar threads with flasked-shaped enlargements, reminding Dr. Klein of the growing and germinating hyphæ of a

mycelial fungus, had been cultivated from the milk of No. 2 cow; all intermediate forms between typical bacilli and these threads were seen in one section.

It appears, then, that the diphtheria bacillus injected into a cow caused constitutional disturbance and death, with definite *post-mortem* appearances. In the course of the illness a teat and udder eruption appeared, and at the time this eruption was present the milk of the affected cow contained bacilli which had all the morphological and cultural characteristics of the diphtheria bacillus. It is to be regretted that Dr. Klein did not apparently test the effect of these bacilli on guinea-pigs.

The difficult points in these results are (1) the threads of bacilli,* and (2) the fatal nature of the illness of these cows compared with the trivial character of the naturally acquired disease in which chapped teats occur.

Subsequently two calves were inoculated by placing in cutaneous incisions the scrapings of the cows' ulcers. They developed similar vesicles and scabs on the belly, coughed, breathed rapidly, had mucous discharge from the nose, and lost flesh. Both were killed on the twenty-fifth day. *Post mortem:* Enlarged glands, consolidated lungs, and fatty degeneration of kidneys. We are not told that any bacteriological examination of the calves was made.

During the experiments on the cows their milk was ordered to be thrown away, but the attendants gave it to the cats which were kept on the premises (Brown Institution). Two cats died after three days' illness.

Afterwards fourteen cats procured from time to time for Professor Horsley, and put into the same shed, became sick, and five of them died. All had the same symptoms: running of the eyes, sneezing, coughing, want of appetite, emaciation and weakness. *Post mortem* showed lobular pneumonia and large white kidney, with fatty degeneration of cortex. In one cat the trachea and lower part of larynx were covered with true, grey diphtheritic membrane, in which were crowds of the diphtheria bacillus. In the bronchial exudation from the other cats the bacillus was found. The cows were in a different part of the building to the cats, but the man who attended on the cows also looked after the cats.

* Woodhead, however, has mentioned involution forms of bacilli in old cultures, "long, irregular, spiral, or swollen and sausage-like chains or strings," also "branched forms." I have seen none of these.

It may be here mentioned that a similar outbreak occurred among the store cats in the same institution the following year, at a time when experiments of a like nature to the foregoing were being conducted on milch cows, but this time orders had been issued that the milk was not to be given to the cats, and the attendants denied having at any time given it to them.

Klein continued his experiments on cows and calves. Omitting details, the following is a brief account of the experiments:—

In 1890, cows Nos. 3 and 4 were inoculated with cultures derived from the tumour of No. 1 cow of the preceding year. Both cows died with symptoms and *post-mortem* appearances like those of cows Nos. 1 and 2.

Diphtheria bacilli were cultivated from the tissue at site of inoculation. In two important respects, however, these cows differed from Nos. 1 and 2. Thus, in neither cow was there observed any affection of the teats or udder, and tubes inoculated with the milk of the cows on the eighth day after injection did not show any diphtheria colonies.

Two more cows, Nos. 5 and 6, were inoculated with a less virulent culture from human diphtheria. Each cow had a slight swelling at point of inoculation, but otherwise remained well.

Seventeen days later (June 24) the same two cows were inoculated with virulent culture from a human source. They had tumours and symptoms the same as cows Nos. 1 to 4. On July 10 both were very ill and wasted, and on this date they were killed. *Post-mortem* appearances similar to those found in the first four cows. Here, again, however, no affection of teats or udder was noticed, and on the eighth day milk from No. 5 cow, and on the twelfth day from the other, yielded no diphtheria bacilli in any of the fourteen tubes which were inoculated.

In 1891 two cows, Nos. 7 and 8, were inoculated with a culture derived from human diphtheria a year before. Both remained fairly well in condition, but had local tumour and also vesicles, scabs and ulcers on the teats and udders, though in cow No. 8 these were not observed till the twenty-third day. Dr. Klein, however, had been absent for three weeks after the inoculation, and on his return he discovered the sores, but not without difficulty, including the throwing of the animals and clipping of hair from the udders; he therefore thinks it probable that they were present at an earlier date. At this date both cows were seen to be shedding hair off the face, neck and haunches. On the twenty-third day after inoculation milk was taken aseptically from No. 8 cow and inoculated into

agar tubes and plates. Colonies like those of the diphtheria organism grew in some of them, and under the microscope—as is evident from the photographs printed in Klein's report—the bacilli were strikingly like diphtheria. This time, however, they were injected into guinea-pigs and proved harmless. Sub-cultures also, Klein thought, were slightly different to diphtheria bacilli. At a later date the milk from No. 7 cow showed staphylococci only, and from No. 8 a bacillus like diphtheria. A week later No. 8 cow's milk again yielded the bacilli; the sores were still present on the udder. The bacilli were said to be true diphtheria in the last two instances, as proved by culture characteristics, but there is no mention of their being tested on guinea-pigs. It is to be noted that No. 8 cow during the eruption showed bacilli in the milk as No. 2 cow had done. A fortnight or so later the cows were free from symptoms and signs and were discarded. Two more milch cows, Nos. 9 and 10, were made to swallow diphtheria culture. No effect observed in four weeks. They were then inoculated in shoulders; local swellings ensued in both, and on the eighth day No. 9 showed one pustule and one scab. No. 10 remained free in this respect, but both at this date were losing hair freely in patches. Each cow had her calf with her, and on the ninth day after the mother's inoculation both calves developed on the upper lip pale raised patches with red vesicular margins—the patches increased in size and number—the largest reached the size of a shilling and the smallest was one-eighth of an inch in diameter. By the end of sixteen days from first appearance all the ulcers had healed. On the tenth day after inoculation the milk from each cow gave no growth on agar or gelatine. Finally, Klein performed similar experiments on calves. Some were inoculated with fresh membrane rubbed into incisions in the belly and groin, and others with cultures. The same redness, vesiculation, ulceration and scabbing were produced on the belly, but the constitutional disturbance was slight and all the animals recovered. One of the calves was inoculated subcutaneously from the same virulent culture which was used for cows Nos. 5 and 6. It had local swelling, tenderness, desquamation over the tumour, was off food, and breathed rapidly, but nine days after inoculation was well and remained so. A scalpel dug into the tumour showed diphtheria bacilli by cover-glass and cultures. The effects in this calf it will be noticed were less severe than in the adult cows Nos. 5 and 6.

Subsequently Dr. Klein examined cows on a farm near Croydon, from which Mr. Philpott, the Medical Officer of Health, thought

infected milk had come; he also examined cows at Bishop's Stortford, where Dr. Turner, Medical Officer of Health, had traced diphtheria to milk supply. In each case he found cows in various stages of ulcers and scabs on teats and udders, from which it appeared clear that a contagious disease characterised by ulcers similar to those produced in the experimental animals was running through the cows in these farms. A bacteriological investigation does not appear to have been made.

As before mentioned, Dr. Klein's experiments and their results appear to have been accepted by a large part of the medical world as more or less conclusive proof that cows suffer from diphtheria which may be transmitted to human beings, and conversely that human diphtheria may be transmitted to the cow. Before summing up the evidence to be gleaned from Klein's researches it may be well to refer to the work of Dr. A. C. Abbott, of Pennsylvania University, in the same field, as set forth in a paper read in May, 1893, before the Association of American Physicians. Abbott states that he was prompted to carry out his experiments by having heard Löffler express an opinion that Klein's results were doubtful. It does not appear, however, that he was acquainted with any of Klein's work, except that reported in 1889, which referred to two cows only, viz., Nos. 1 and 2 above mentioned. Abbott's first cow was in advanced tuberculosis when the experiment began. One cc. of a broth culture said to have been virulent was injected into tissues of right shoulder. Beyond a slight additional rise of temperature, a cough, and some tenderness and swelling at site of inoculation, she showed no marked constitutional disturbance, and was never off her feed. She died, however, sixteen days after the injection. At no time was any eruption found on teats or udder. *Post mortem:* The tuberculous process was found to be so widespread that no attempt was made to study the changes described by Klein. Scrapings from the interior of the local tumour gave no diphtheritic bacilli on serum or glycerine-agar, but sections of the tumours showed clumps of the diphtheria bacilli.

The second cow, described as thin but healthy, was inoculated a month later with 1 cc. of a broth culture of which $\frac{1}{2}$ cc. killed a guinea-pig in sixty hours. There followed a little swelling and tenderness at site of injection, with slight rise of temperature for two days. She showed no other constitutional effects, except that after the fifth day she seemed weak. There was no eruption on udder or teats at any time. On the twentieth day after inoculation she was killed. *Post mortem:* Lungs, pleuræ, pericardium and

endocardium normal. On the liver, which was otherwise normal, were three yellowish spots on the under-surface extending a short distance into liver substance; also a "few scattered irregular whitish points. On the surface of one kidney was a small whitish area due to fatty change, besides two or three cysts." Spleen, &c., normal. In the lymphatic spaces between the tissue bundles in the tumour were masses of leucocytes, among which bacilli were scattered irregularly, but not in bundles as in the first cow. These bacilli, like those found in the first cow, were morphologically and by staining identical with the diphtheria bacillus, but five scrapings inoculated on five blood serum tubes and sometimes glycerine-agar plates as well, were inoculated with milk in amounts varying from 0·05 to 0·3 cc., but among the numerous colonies of cocci and bacilli developed in no instance was the diphtheria bacillus found.

Dr. Abbott's results were, we see, chiefly negative. As he says, his results differed from Klein's in "essential points." His first cow may be left out of consideration as she was in no way fit for experimental purposes. The second cow, as pointed out by Klein in his reply to Dr. Abbott's report, was not subjected to a very virulent culture, and it seems to me that this experiment may suitably be compared with the first experiment performed on cow No. 6. It will be remembered Klein used a less virulent culture (of six guinea-pigs inoculated with this culture three died and three recovered, whereas his virulent cultures in the same dose—$\frac{3}{4}$ cc.—killed guinea-pigs in from thirty-six so forty-eight hours) comparable to that of Dr. Abbott ($\frac{1}{2}$ cc. Dr. Abbott's culture took sixty hours to kill a guinea-pig), and in both cases the sole effect was a slight swelling at the point of inoculation. The only important point elicited in Abbott's experiments appears to be that in spite of repeated attempts he failed to find the bacillus in the milk; because if the bacillus is excreted in the milk of the cow, we might reasonably expect it to be present at some period in the mild as well as in the severe disease. Klein, however, does not appear to have made a bacteriological analysis of the milk of No. 6 cow in the first experiment performed on that animal. From Klein's data I construct the following tabular statement of results.

The experiments on calves are not included in the following table. A study of the table makes it evident that some cows, in common with horses, rabbits, monkeys and guinea-pigs, are injuriously affected by the diphtheria bacillus and its toxins from human sources, when both are inoculated artificially into the tissues. Also that like other animals their susceptibility varies, some being

TABULAR STATEMENT OF KLEIN'S RESULTS IN EXPERIMENTS ON COWS.

No. of experiment	No. of cow	Source of culture	Local tenderness or tumour at site of puncture	Severe constitutional disturbance	*Post mortem:* Congestion of lungs and changes in other viscera	Eruption on teats or udder	Bacillus diphtheriæ: Present in lymph of vesicles and pustules	Bacillus diphtheriæ: Present in tumour	Tissues: Cultivated from tumour	Tissues: Pathogenic effect on guinea-pigs	Milk: Cultivated from milk	Milk: Pathogenic effect on guinea-pigs
1	1	Man	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not tried	Not tried	—
2	2	,,	,,	,,	,,	,,	,,	,,	,,	,,	Yes	Not tried.
3	3	Cow	,,	,,	,,	No	—	,,	,,	,,	No	—
4	4	,,	,,	,,	,,	,,	—	,,	,,	,,	,,	—
5	5	Man	,,	No	—	,,	—	?	—	—	Not tried	—
6	6	,,	,,	,,	—	,,	—	?	—	—	,,	—
7	5	,,	,,	Yes	Yes	,,	—	Yes	Yes	Not tried	No	—
8	6	,,	,,	,,	,,	,,	—	,,	,,	,,	,,	—
9	7	,,	,,	No	—	Yes	Not tried	?	—	—	,,	—
10	8	,,	,,	,,	—	,,	,,	?	—	—	Yes	Not tried.
11	9	,,	Fed with diphtheria culture. No effect in any way.									
12	10	,,										
13	9	,,	Yes	No	—	Yes	Not tried	?	—	—	No	—
14	10	,,	,,	,,	—	No	—	?	—	—	,,	—

killed by a small dose of a broth culture, while others under a similar dose suffered little inconvenience. It is seen also that very soon after in five out of the twelve inoculations the cows developed an eruption on the teats and udders; of these five cows, two were so severely affected that one died and the other had to be killed, whereas the remaining three suffered no constitutional disturbance. The eruption is described as identical in appearance with that observed in cows in suspected dairies—an eruption, be it observed, which is so common among cows after calving and so harmless (to the cows) that the cowkeepers were accustomed to disregard, and indeed in some cases had not noticed, its existence until it was pointed out to them by the inspecting medical officer. Among the cows which did not show the eruption, some were affected so severely by the diphtheria poison that they died, while others were very little disturbed; and it is, moreover, noteworthy that two cows which failed to show the eruption under the mild symptoms produced by a culture of low virulence failed also to produce this sign when subsequently inoculated with a virulent culture. I am therefore constrained to remark that if I had come to a decision on this evidence without the aid of bacteriology, I should doubt that the injection of diphtheria culture had anything to do with the eruption. The coincidence would not be very remarkable if five cows out of ten undergoing experimental treatment were to develop a common contagious disorder during the process, especially as the animals appear to have newly calved, and to have been all stabled in the same institution; having in view also that we do not know whether these cows had suffered from the disease before, or whether the cows which did not get the eruption had acquired immunity by a former attack of this common disease. We also have the second experiment of Dr. Abbott, in which the inoculation of a culture of no great virulence produced no more effect than was observed in Klein's experiment, which is numbered 6 in the table.

Klein's bacteriological evidence is not so easily disposed of; indeed, if characteristic pathogenic effect on guinea-pigs had been proved, the evidence would have been almost convincing that the living bacillus of diphtheria may pass through the cow, and it would have justified *a suspicion* that there is a specific cow diphtheria with local lesions visible in the udder and teats. We should still have been in doubt, however, as to whether the bacillus was secreted in the milk, or passed from the teat and udder sores into the milk, inasmuch as in the only two cases in which the bacillus was found in this fluid it was so discovered in milk taken at the

time the cow was suffering from the eruption. Moreover, in one cow (No. 8) the bacillus was not present three days after the disappearance of the eruption, and in another cow (No. 2) the milk was not examined after the eruption had faded. It might be suggested that the teat sores already arisen from some other cause had been infected by the secretions of the cow which is by no means impossible as is shown by my experiments (reported in the *Lancet*, November 19, 1898), in which experimental guinea-pigs had abundant diphtheria bacilli in the urine; but their elimination in this way would not necessarily argue the existence of a cow diphtheria occurring naturally. A diphtheritic sore of such a kind would be comparable to the diphtheria artificially produced on the abraded ear of a rabbit and would not imply that the bacilli had caused the original sores.

The presence of the bacillus in the tumour is of little importance, inasmuch as it had been planted there, and taking into consideration that it can be found in the local tumour produced by injection of diphtheria culture into a guinea-pig, an animal which, as far as I know, has not been suspected of suffering naturally from diphtheria.

Klein admits that he more than once obtained from the milk a bacillus so like that of diphtheria that he had to go through a long examination by sub-cultures and inoculations of guinea-pigs before he could satisfy himself that it was not the real bacillus. We are compelled, therefore, in the absence of any proof of pathogenic properties in the bacilli which he did consider to be diphtheria, as also in consideration of the above-mentioned experimental evidence that the bacillus may be found in the urine of an animal injected with living culture, to come to the conclusion that it has yet to be proved that the cow suffers naturally from a disease corresponding to human diphtheria. All the same, there is no doubt that milk is a possible factor in the dissemination of diphtheria owing to contamination by human beings, and is on this ground to be regarded with suspicion during diphtheria outbreaks. Moreover, until more is known about the eruption on cow's teats it would be well to avoid the use of milk, and especially unscalded milk, from cows having the eruption.

In conclusion (of the cow question), it may be remarked that Dr. Klein and Dr. Power ascribed scarlet fever also, in the now historic Hendon outbreak of 1885-86, to a cow disease associated with ulcerated teats and loss of hair.

DIPHTHERIA IN KLEIN'S CATS AND IN OTHER ANIMALS.

In 1888 Klein showed that by inoculating the previously abraded conjunctiva of a cat with diphtheritic membrane from man, purulent inflammation and subsequent corneal ulcer were set up, and that inoculation with the discharge therefrom would produce a similar disease in other cats. From the cornea of a cat thus affected he isolated a bacillus which was very minute and bore a strong cultural and morphological likeness to the Klebs-Löffler bacillus, and was capable of setting up in cats a similar eye disease to that caused by the diphtheritic membrane. In 1890 he injected cats with pure culture derived from human diphtheria and also with culture obtained from human source, but afterwards passed through a guinea-pig (bacillus recovered from guinea-pig's inguinal gland). The cats died. *Post mortem :* there was in greater or less degree in all of them hæmorrhagic œdema, lungs and spleen congested and liver slightly so. The kidney changes were most marked; the whole organ enlarged; cortex pale, grey, and fattily degenerated; medulla congested. A few bacilli recovered from the œdematous subcutaneous tissue were characteristic, but like the eye bacillus they were small. The changes were similar but less constant and marked in some cats subcutaneously inoculated with gelatine culture derived (through several generations on gelatine) from a cat's cornea some months before. Klein afterwards studied a disease occurring naturally in cats. One of these animals which had been sick in the Chelmsford district as before mentioned, was killed after it had become convalescent. *Post mortem :* Klein found the lungs, liver and throat normal, the spleen showed several dark red patches, while both kidneys were large and their cortex (which was whitish-grey) in a state of marked fatty degeneration. Again, a dead cat connected with the Camden Town cases was examined. Both lungs showed patches of grey hepatisation and the right upper lobe was almost completely solid. Liver showed small black patches and a few greyish spots on its surface. Both kidneys were greatly enlarged and the entire cortex whitish-yellow; under the microscope uriniferous tubules fattily degenerated. A live cat was sent to Klein at the same time as the above-mentioned dead one. It had been ill for three weeks with sneezing, dyspnœa, and difficult deglutition and wasting. Five weeks later it was thinner and its hind limbs were completely paralysed. It was then killed. *Post mortem :* Liver and kidneys as above. A cat that died during the Shrewsbury outbreak was also examined. *Post mortem :* Lungs, patches of grey hepatisation, liver and kidneys similar to the above.

The cats, then, which died, as it was thought, of diphtheria contracted from human beings, presented *post-mortem* appearances identical with those found in cats experimentally inoculated with culture of diphtheria bacilli taken from the throat membrane of man. In these cases Klein discovered no bacilli in the lungs or other organs, whereas he had found them in the bronchial mucus of the cats thought to have died from drinking milk of experimental cows.

Surmising that at the late stage in which he saw the cats the bacilli might have disappeared, leaving only the traces of their handiwork behind them, much as in diphtheria in man the membrane may disappear from the throat before the death of the patient from paralysis, &c., and also suspecting that the lungs were the seat of localisation of the disease in cats, Klein carried out the following experiments on two cats.

By means of a syringe diphtheria bacilli was injected into the trachea. Next day both cats were of course ill. One died in twenty-six hours. *Post mortem:* Congestion of lungs, liver and kidneys—cortex of kidney showing more or less confluent patches of greyish-white tissue.

The second cat, alive but paralysed on the sixth day, was killed. *Post mortem*: Left lung pneumonic. Liver enlarged and utterly degenerated. Kidneys enlarged, the cortex forming a uniform mass of whitish-yellow fattily degenerated tissue. Lung juice showed diphtheria bacilli, smaller than those from human diphtheritic membrane. Cultivations of the lung juice of both cats revealed the presence of colonies of the bacillus diphtheriæ as well as numerous colonies of staphylococcus aureus.

It has already been related how on two occasions epidemic disease occurred among cats in the Brown Institution, and it was thought that the disease was due either to drinking milk of cows experimentally inoculated with diphtheria, or to direct contagion in some way from these cows, which were stalled in the same institution. Dr. Klein, by way of elucidating this matter, experimented as follows in 1890:—

(1) One kitten and two cats were fed with recent agar culture of bacillus diphtheriæ mixed up with some milk. The animals remained well.

(2) June 14: Two cats were fed with a culture of the diphtheria bacillus incubated in milk at 37° C. for nine days. June 16: One cat quiet and off her feed—the other all right. June 19: One cat still quiet and now sneezing and coughing—the other remaining all

right. June 20: Cats lively and well—both fed with gelatine culture of diphtheria diffused in warm milk. June 23: Both well—fed again in similar manner—same evening the two cats were sick. June 24: Both quiet and off feed. June 25: In same condition, and one sneezing a good deal. June 27: Both quiet, off feed and getting thin. July 2: Both quiet, and one sneezing—one was now very much emaciated. July 4: One cat extremely thin and weak; could hardly walk, and coughed a good deal—this animal was now killed. *Post mortem:* Both lungs showed patches of grey consolidation; liver much enlarged; on its surface and in its tissue numerous blackish-brown patches due to stasis and coagulation of blood in the capillaries; acini of liver fattily degenerated and whitish-yellow; both kidneys enlarged, and cortex white. July 11: Other cat now very thin and was killed. *Post mortem:* Same as above. Klein does not say that he found bacilli in the lungs in these two cases.

A point worth noting is that a single feed of bacilli did not cause illness except in one case, but the more continuous administration of infected milk appeared to induce sickness in the two cats treated. The *post-mortem* appearances were similar to those observed in all the cats examined. The symptoms noted among cats taken ill during the various outbreaks of diphtheria as far as they go, are similar to those noted in the experimental animals, except that in the latter there was not the dyspnœa or swelling of the neck which was observed in some of the former.

We have then a cat-disease characterised by sneezing, coughing, running of the eyes, want of appetite, occasionally dyspnœa and swelling of the neck, together with progressive emaciation, sometimes paralysis. *Post mortem:* The principal and most constant change apparent is in the kidneys, which are enlarged, their cortices whitish-yellow in colour and in a state of fatty degeneration. Cats inoculated subcutaneously and intra-tracheally with diphtheria culture, or fed with diphtheria bacilli, became very ill, and either died or were killed when seriously ill. *Post mortem:* The appearances were the same as those found in the animals which died of the disease naturally acquired.

Contagious purulent diphtheria was induced in cats by inoculation with diphtheria membrane, and a small bacillus, like the diphtheria bacillus, obtained from the discharge, reproduced the disease in other cats. The subcutaneous tumour in the inoculated cats and the lung juice of those intra-tracheally injected, yielded a similar minute diphtheria-like bacillus; so also, as said

before, did the bronchial mucus of the cats which died in the Brown Institution during the treatment of the cows. In some of the cats which acquired the disease naturally, and in those infected by artificial feeding, the bacillus was not discovered, and in the experimental cats it was, in fact, recovered only from the place in which it had been originally planted in the body. When so found it presented an appearance which may have meant that it had undergone degeneration, *i.e.*, it was very much smaller than the bacillus met with in human diphtheria. Here, again, as in the case of the cow experiments, the crucial test of virulence, viz., injection into a guinea-pig, seems unfortunately to have been omitted, and it does not appear that the minute bacillus was sub-cultivated with a view to bringing it back to the size of the bacillus from which it was supposed to have originated; that the minute bacillus was, in fact, the diphtheria bacillus, is more or less a matter of conjecture. Klein, however, concluded that the cat suffers naturally from a disease identical with that which he experimentally induced; and that the cat-disease is diphtheria, differing only from human diphtheria in that the bacillus is slightly altered by environment and its principal local seat is not the fauces but the lungs, a disease, moreover, capable of transmission from man to the cat, and conversely from the cat to man. But it seems to me that the proof of identity of cat diphtheria and human diphtheria is still to come. The conditions which favour the spread of human diphtheria may possibly obtain in the case of the cat disorder, and this would account for their prevailing at the same time; the recorded evidence of any such prevalence, however, is somewhat meagre, and consists mostly of casual allusions and incomplete experiments.* The epidemics in the Brown Institution may have been entirely independent of the cow experiments, cats were kept in the place in considerable numbers; they were continually being added to by cats from the outside; they did not all get the disease at once but from time to time, as though the disease were hanging about the place in which they were confined. The second cat epidemic was possibly the seasonal recrudescence of the disease; moreover, Klein could only indirectly connect it with the cow experiments. The disorder, too, according to the veterinary surgeon, was not an uncommon one among cats in the neighbourhood at the time.

* *E.g.*, R. J. Reece, L.G.B., on Aldershot outbreak, August 31, 1899. The bacillus has many imitators; only complete investigation by expert bacteriologists can be relied upon.

The fact that animals fed with diphtheria bacilli developed the disease is at first sight very striking. Even this, however, is possibly explainable as above, if, as we surmise was the case, the cats were kept in the Brown Institution near each other. It may be supposed that the institution was infected by its former denizens, and that the disease was contracted from, as well as in, the place. In this connection it is noteworthy that the cats were kept some time before one of them got the disease, and the second cat got it a week or more after the first one. This suggests infection of No. 2 by No. 1.

I have given merely an abstract of Klein's experiments, withal it is rather long, but to have further abbreviated his report would have depreciated its value.

Diphtheria in Horses.

More definite information than had hitherto been forthcoming in regard to animal diphtheria has been brought forward by Dr. Fraser of Portsmouth and L. Cobbett.*

Dr. Fraser cultivated a short bacillus from the nasal discharge of a pony belonging to a child who was ill with diphtheria. This he sent to Cobbett, who made sub-cultures and thoroughly tested the bacillus. It answered all the tests and, most important of all, proved pathogenic to guinea-pigs (presumably the *post-mortem* appearances were typical of diphtheria poisoning). Its toxin was neutralised by antitoxin. The experiments are given in full detail as far as Cobbett's part is concerned, and seemed clear enough.

Cobbett thinks this experimental result and the fact that some horses have some antitoxic power before they are artificially inoculated (a power which he ascribes to supposed previous attacks of the naturally acquired disease) show that the horse suffers from a diphtheria communicable to man. The reviled motor-car, then, may after all prove itself a blessing by diminishing the equine population. It remains for some one to confirm Cobbett's results.

The existence of a natural horse diphtheria, or any animal diphtheria, goes for very little unless it be proved to be transferable to human beings. Many human parasites have their analogues in animals — malaria for example — but they are generally non-transferable as far as we know. It is questionable how far the fact that horses undergo more or less safely the injection of live diphtheria bacilli discountenances the idea that the diseases are identical.

* *Lancet*, August 25, 1900.

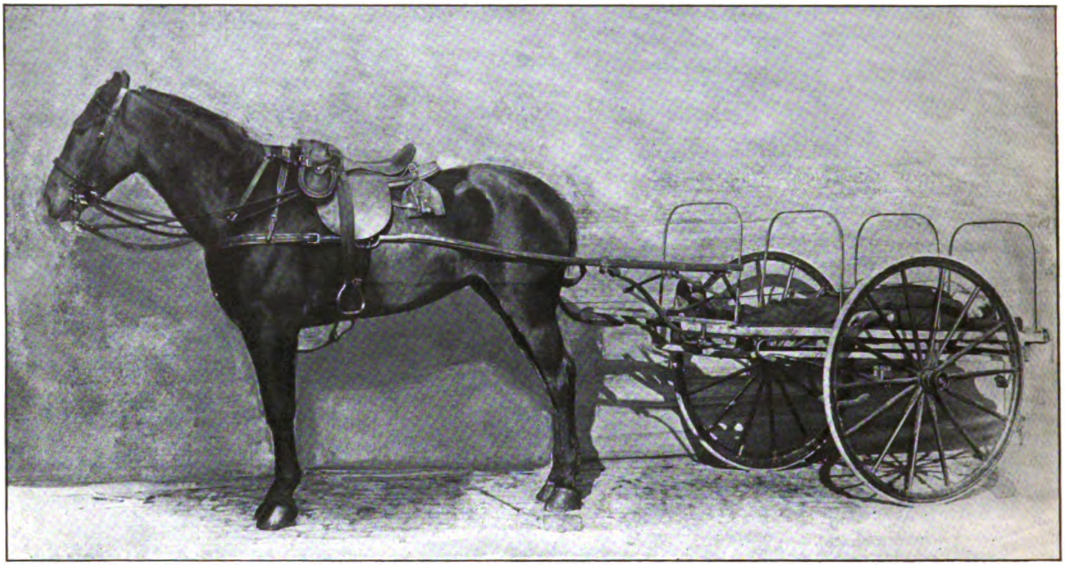
In addition to fowls, pigs, dogs, rabbits, cows, cats and horses, already spoken of, other animals and birds, such as sheep, turkeys, pigeons, &c., have been thought of in connection with diphtheria and the inter-communicability of the disease suspected, but on somewhat slender grounds. There is, indeed, rather a bewildering variety of these suspects. Löffler has shown that pigeons and fowls suffer from a disease characterised by false membrane in the mouth and associated with a bacillus, but he does not consider that the bacillus is the diphtheria organism.

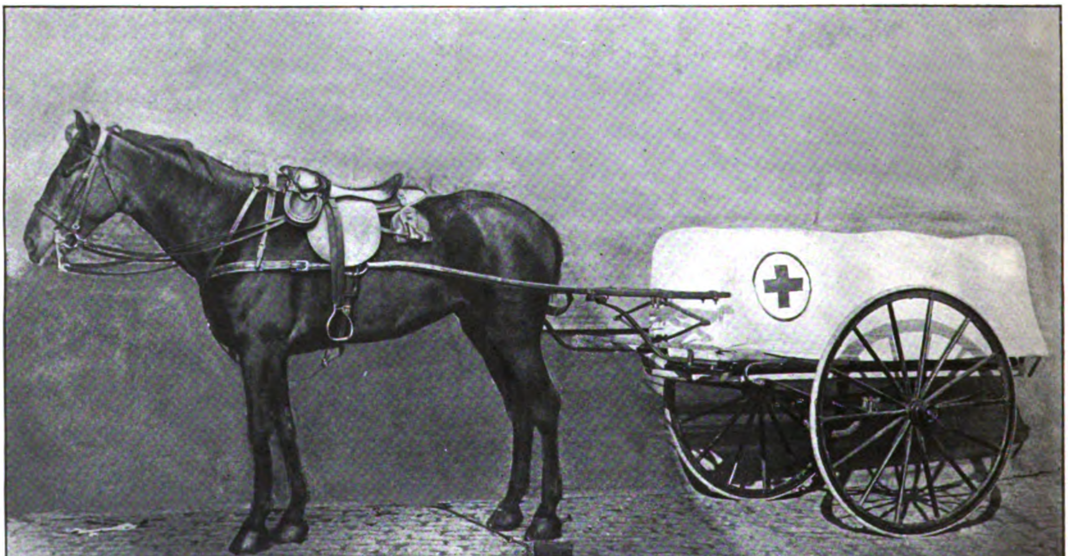
If fruit-eating birds suffered from a communicable diphtheria the autumnal rise of the disease would be partly accounted for.

Animals and Flies as Carriers of the Human Disease.

That domestic animals, birds and insects sometimes act as carriers of contagion, seems highly probable. It is especially such of these creatures as eat the same food as man which must be regarded as dangerous, *e.g.*, dogs, cats, birds, rats and mice, wasps, flies, &c., most of which are in the habit of eating and thus contaminating themselves with various kinds of filth.

That flies are possibly an occasional source of diphtheria is shown by the experiment of mine reported in *Public Health* for December, 1898; albeit we cannot well ascribe to these insects any very large share in the diffusion, inasmuch as the disease is very prevalent in the winter when they are not in evidence. It was shown that insects' feet may carry diphtheria germs, and when I call to recollection having seen flies in a sick room browsing on the edges of spitting cups and upon excreta, while also they seize every opportunity of varying this diet with one of milk or other food, sometimes from the lips of patients, I am led to regard the fly as a very dangerous companion.





To illustrate paper by Lieut. LEONARD AVERY.

A NEW GALLOPING AMBULANCE, KNOWN AS "THE RAPID TRANSIT AMBULANCE."

By LEONARD AVERY, M.R.C.S., L.R.C.P.
Surg.-Lieut. Suffolk Imperial Yeomanry.

THIS ambulance was designed with a view to filling the want of stretcher bearers with mounted troops. The endeavour has been to construct a light strong carriage easily adjustable to any mounted horse and capable of keeping up with cavalry through any sort of country.

As will be seen from the accompanying illustration, the ambulance is a two-wheeled contrivance. The body consists of a platform fixed to a crank axle by long springs between 46-in. wheels. This platform is 2 ft. 3 in. from the ground, and is arranged to carry an ordinary service stretcher. The forepart consists of a pair of short shafts which are attached to the body by an arrangement of springs adapted to prevent the side-to-side motion caused by the action of the horse. The shafts reach as far forward as the saddle flaps, where they are held in position by a girth strap, breastplate, and belly-band.

The body is covered by a canvas hood. The weight is about 3 cwt. Length over all, 12 ft. Track, 4ft. 1 in. Surgical dressings, splints, water-bottle, &c., are carried. It is quite easy for the driver, having placed a wounded or helpless man in a stretcher, to transfer him from the ground to the platform of the carriage single-handed.

This ambulance has been on duty with the Suffolk, Sussex, Surrey and Middlesex Imperial Yeomanry during their respective trainings, and also with the Wiltshire Yeomany through the recent manœuvres. It is a very comfortable conveyance, and has proved itself capable of negotiating almost any country.

SURRA.

This short notice of surra is written in order to induce R.A.M.C. officers living in surra districts to assist in filling up a few gaps in our knowledge of this disease.

It is true that surra is not a human disease, but it is none the less of very great importance from an Army point of view, as a force which has to operate in a surra district may lose the greater part, if not all, its transport and riding animals, with disastrous results. Surra generally occurs in hot climates and in low-lying, damp localities, hence a large number of sick men may be expected coincidently with the appearance of surra, and the question of transport is certain to furnish a good deal of anxiety for the medical officer. In this way surra may closely concern us. Moreover, Leishman's recent observations on the spleens of men dying of Dum Dum fever suggest the possibility of another trypanosome disease, in addition to sleeping sickness, occurring in man, so that any fresh information as to the method of spread of trypanosome diseases in general will be of value.

The disease is a parasitic one caused by the *Trypanosoma Evansi.* The characteristics of the disease are, progressive wasting and muscular weakness, associated with irregular fever. The disease has been known in India for centuries, but its actual cause was only discovered in 1880 by Evans, a veterinary surgeon.

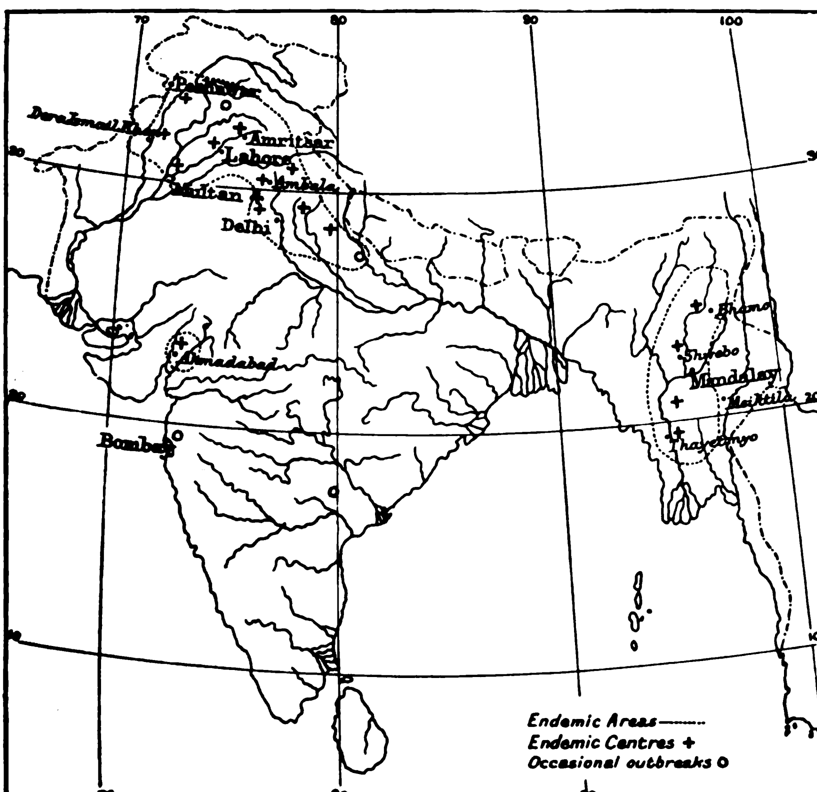
Distribution.—The information available as to the distribution of surra is not very extensive, and later researches will probably show that its epidemic distribution is much more extensive than is indicated here. The disease usually appears during the rainy season and disappears gradually with the advent of the cold, dry weather. The places in which surra is reported to occur annually are mostly situated close to swamps, or alongside rivers, and are liable to inundations during the rains.

The accompanying map shows roughly the area in which it has been reported to occur, although it probably has a much wider distribution. Lingard says it is confined to a belt lying between 18° and 34° N. Lat.

Susceptible Animals.—The horse and mule are most susceptible to surra, the dog coming next—these three practically always succumbing to the disease. The camel is supposed to live for three years after being infected, while the ox generally recovers after some five or six months.

Infecting Agent. — Lieut.-Col. Bruce, F.R.S., R.A.M.C., has shown that two other trypanosome diseases, viz., nagana and sleeping sickness, are transmitted by means of a tsetse fly, the parasite undergoing no change in the insect, but merely being carried from an infected to a healthy animal. As nagana closely resembles surra in its clinical course, and the two parasites are very similar in appearance, it does not seem unreasonable to suppose that the in-

Distribution of Surra in India and Burmah.



fecting agent is also similar. Up to the present no tsetse fly has been found in India. Rogers made some experiments to see if the infection is carried by the common horse fly, but the results of his work rather negative this.

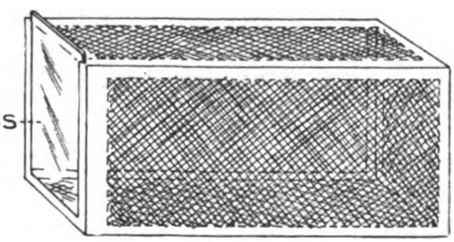
Now, one point we wish to clear up is, "What is the infecting agent in Surra?" In rats the *Trypanosoma Lewisii* is said to be

5

carried by rat fleas; in Nagana the Trypanosoma is carried by the *Glossina morsitans;* in Sleeping Sickness the *Trypanosoma Gambiense* (?) is transmitted by *Glossina Palpalis;* in Dourine the *Trypanosoma Rougeti* is said to be conveyed in the act of coitus. How is *Trypanosoma Evansi* carried from the infected to the healthy animal? We would be greatly obliged to any R.A.M.C. officer living in a surra district who would try to clear up this point. In searching for the carrying agent we would suggest that some such line as the following might be tried:—

In a surra district try to make out what blood-sucking insects are present. In nagana there would be no difficulty in determining which fly is to blame, as the tsetse fly is found in great numbers in the fly-belt and not outside it. Now, having a suspicion that a certain fly carries the infection, catch and imprison as many as possible in small cages made of wood, mosquito netting and glass.

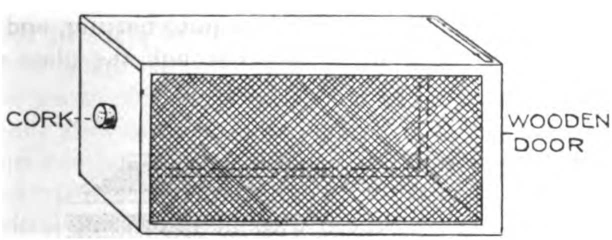
The following drawing represents a cage suitable for this purpose, and a useful size is 6 × 3½ × 3½ in. As will be seen from the drawing five sides are covered with mosquito netting, and one end is occupied by a sliding glass door. Through the glass door the flies can be readily examined.



A useful box for taking into the field in which to place the newly-caught flies may be made something like the following drawing. It is best to make these catching boxes the same size as the cages to facilitate the transference of the flies. It will be seen from the drawing that both ends and two of the sides are of wood, one end is perforated by a hole ½-in. in diameter and plugged by a cork. It is through this hole, of course, that the flies are introduced after being caught. The other end is a sliding door fixed by a screw in order that it will not accidentally fall out, and to prevent a native carrier playing with it. When changing the flies from the catching box to the cage, place the two boxes with the door ends facing each other, and round the two an indiarubber band; raise the two doors

but do not pull them quite out, and with a little noise of hitting the box with your hand the flies will move into the cage.

The flies are most easily caught by means of a small butterfly net with a diameter of 4 to 5 inches, and having a short handle. Having secured the flies, do not let them feed for a couple of days. Then apply the cages to a diseased surra animal, and make a note of how many flies feed. Keep each cageful of flies unfed for various periods, say eight hours, twenty-four hours, forty-eight hours, after which let the flies feed on separate healthy animals, probably dogs would be most easily obtained. The dog's blood must, of course, be previously examined and found to be free from trypanosomes. The animal experimented on should also be in a healthy district away from a surra locality, so as to avoid the chance of infection reaching it by other channels. In Zululand we kept our animals on the top of a hill and sent down to the low country at the foot for the flies.



The temperature of the animal must be taken twice a day, and the blood examined frequently for trypanosomes, especially when any rise of temperature takes place.

Any blood-sucking insects sent to the editor will be examined and named, and it may be remarked that as blood-sucking flies other than mosquitoes are becoming daily of more importance, it would be doing valuable work if our officers stationed all over India would collect and send here any specimens which occur in their neighbourhood. A list of such flies could be given in the Journal with the donor's name opposite. Flies when caught may be placed in cigarette or other tins, with a little cotton-wool to prevent damage in transit, and some powdered naphthaline to preserve them.

Editorial.

At the beginning of a new year, and a new volume of the Journal, it may be well to briefly review our position and state what we believe ought to be the main objects of this Journal.

Under the very able temporary Editorship of Lieut.-Col. Firth the Journal has had a good send off, and it will be a difficult task to keep it up to its present high standard. Many of the papers sent in during the last six months have been excellent.

With this brief review of the past let us turn our eyes to the future and consider what is the main function of our Journal. As we are all aware, the Committee appointed by the Secretary of State to consider the reorganisation of the Army Medical Services laid down the principle that in order to increase the efficiency of the Corps, and to enable it to take its rightful place in the Medical Profession and the Army, every effort must be made to foster and strengthen habits of professional and scientific work among its members. As regards professional and scientific work the R.A.M.C. has unique opportunities. In most foreign stations undescribed things are often met with, and in times of peace there is as a rule ample leisure to work at these without interfering with ordinary routine duties. In attempting to act up to the principle laid down by the Reorganisation Committee, it must be evident that everything will depend on the selection of officers for the administrative posts who are in practical sympathy with this principle. A change in the aspect of affairs will be made in a short time if senior officers are themselves workers, and are filled with the desire to encourage work in those under them. Hence it will be the duty of senior officers in the future to be in touch with their juniors, pointing out to them from their larger experience the most fruitful lines of work which remain to be done in their particular district, and inciting them by every means in their power to the investigation of all matters relating to the knowledge, prevention and treatment of the diseases in the district and among the soldiers serving in their command, and undoubtedly the amount of scientific and professional work coming from a district will reveal the presence of this active and sympathetic superintendence.

Papers on the results of such work would naturally be sent to head-quarters for publication in the Journal. It is by paper

publications of various kinds that the civilian Medical man as a rule works himself into recognition and gains posts of importance, and there seems no reason why Army Medical Officers should differ from Civilians in this respect. In this way it is hoped that in a short time a knowledge will be gained at head-quarters of many of the officers and their capabilities, in order that those who show any particular bias may be assisted as much as possible, and afforded opportunities of working at their special subjects. Officers may be reminded here that promotion to the next higher rank may be given for distinguished service of an exceptional nature other than in the field, and that distinction in professional and scientific work comes under this head. In short, what the main function of this Journal is, is to assist in making the R.A.M.C. into a scientific Corps by which a large part of the scientific medical work of the Empire will be done. Just as the R.E. supply men to do much of the scientific engineering work of the British Empire, so it is hoped the R.A.M.C. will supply men for the investigating of all medical problems which tend to hinder the development of our Protectorates and Colonies. One of the first things to be done in a new colony, as everyone agrees, is to have it carefully mapped and surveyed, but it is also very important that the climatic and health conditions of the country should be surveyed and mapped out at the same time. It is needless to give examples—they are met with at every turn in history, and in individual experience.

To show that this is no mere chimera, this idea of widening the bounds of the R.A.M.C., it may be mentioned that during the last few weeks the Corps has supplied three officers to take up important scientific work. Further, sanitary appointments and laboratories for the prosecution of scientific research are being put up at Military stations all over the world, and officers holding these appointments will have the opportunity of devoting themselves entirely to the investigation of the causes and prevention of disease. If the bounds of the R.A.M.C. are widened in this way, it ought to attract into it every ardent young student of our Universities and Medical Schools who has a desire to win a reputation and serve his country.

It is time to be stirring. The R.A.M.C. is falling behind in the race. A German has discovered the cause of cholera, an American that of yellow fever, a Japanese plague. The R.A.M.C. has stood by while malaria was being elucidated, by an Englishman it is true, but not an R.A.M.C. officer. Even at the present moment, and in

spite of the primary discovery having been made by Professor Leishman, R.A.M.C., the elucidation of the etiology of Dum Dum Fever is being taken out of the hands of the Corps.

ANTI-MALARIA CAMPAIGN.

THE reports to the Malaria Committee of the Royal Society* contain a very interesting report by Captain S. P. James, I.M.S., on the anti-malaria operations at Mian Mir in the years 1901 and 1902. We mention some of the more important features below, but a perusal of the original will well repay anyone who contemplates attempting any work of this kind.

As the area covered by Mian Mir cantonment was considered to be too extensive for the purpose in view, it was decided to limit operations to the Royal Artillery section, which is more or less isolated from the rest of the cantonment. The reason for choosing Mian Mir was that it is a very malarious station, with a small rainfall, hence it was hoped that all the mosquito breeding places would be found in the irrigation channels, and so be accessible to control.

The first step was to determine the "malarial endemic index," *i.e.*, the percentage of native children with the malarial parasite in the peripheral blood, and the same for enlarged spleens. This was determined monthly; a rise was found to take place between the end of July and the end of October, which shows that this is the period of fresh infections. Attacks of fever taking place at other times of the year are due to relapses.

The next question was to examine into the parasite-carrying mosquitoes. The commonest Anopheles were *A. Rossii* and *A. culicifacies;* 496 of the former were examined with a negative result, while out of 259 of the latter, sporozoites were found in 12 = 4·6 per cent.

Two interesting charts are given; the first shows that *A. culicifacies* are found in the largest numbers in the middle of October, and that this coincides with the maximum number of admissions to hospital for malaria among the troops, and also with the maximum endemic index in the British Infantry bazaar. The second shows that the period of maximum irrigation is in the middle of May,

* Published by Harrison and Sons, Limited, St. Martin's Lane.

while the maximum rainfall occurs in the middle of July. This does not support the old idea that the incidence of malaria directly corresponded to the amount of irrigation.

Breeding places.—Capt. James enumerates eleven places in which Anopheles' larvæ were found at some time or other during 1902; these may be practically summed up by saying that any collection of water of any kind may contain Anopheles' larvæ, although they are not so common in wells. *A. culicifacies* prefers as a breeding place the smaller irrigation courses in which the flow is slow and weeds and grass abound. The primary object in the operations was to test the efficacy of mosquito destruction as a means of preventing malaria. The following tests were employed to estimate the results obtained:—

(1) The reduction in the number of Anopheles as shown by (*a*) the number of larvæ found in the breeding places; (*b*) the number of adult Anopheles present in the houses in the bazaars.

(2) The reduction in the amount of malaria, tested by (*a*) reduction in the number of admissions for malaria among the troops; (*b*) decrease in the number of troops infected with malarial parasites; (*c*) diminution in the number of children in the bazaars infected with malarial parasites.

It is remarked that the first of these tests is probably the least reliable, as hospital statistics are liable to be affected by many causes, still if the operations were to be considered successful, there must necessarily be a reduction in the number of admissions for malarial fevers. The best test would be the reduction in the number of infected children in the bazaars.

Operations.—These were conducted on three main lines. (1) The destruction of mosquitoes. In order that this might be carried out in a systematic way, the area selected was divided into six sections, so that each one would be visited at least once a week. The actual operations consisted in (*a*) smoothing the sides of the water-courses and freeing them from grass and weeds; (*b*) bricking one course which ran through the Artillery lines; (*c*) cleaning out and thoroughly drying water-courses once in ten days—this had to be abandoned on account of the expense; (*d*) oiling irrigation courses and pools, and filling in the latter where practicable. As a result of these measures, breeding was to a certain extent prevented; constant work and supervision are necessary as a temporary interruption, for even a week allows the former condition to become re-established. As regards adult Anopheles, although these were decidedly fewer, still *A. Rossii* and *A. culicifacies* could be caught

with ease at any time from July to November in the houses in the bazaar. In December no adult Anopheles could be found in any houses in the cantonment, nor could any Anopheles' eggs or larvæ be detected in any of the breeding places for a distance of a mile around Mian Mir. Hence if adult Anopheles re-appear they must have come in from beyond this distance.

(2) The second method employed was the destruction of the malarial parasites in the infected individuals, or the removal of such persons from the vicinity of the operations. For control purposes no operations of any kind were undertaken in the British Infantry bazaar. The year 1902 was also a very healthy year as compared with 1901.

The hospital followers' lines could not be removed to a distance, so all children, as also those in the right battery lines, were regularly dosed with quinine. In the Royal Artillery bazaar the only operation undertaken was the destruction of mosquitoes. The left battery syce lines were removed to a new site distant 600 yards from the nearest pool, and ¾ mile from the nearest irrigation course.

The results obtained by these measures may be compared by means of the following tables:—

	Oct., 1901.	Oct., 1902.
Royal Artillery Bazaar:—		
Percentage of infected children ...	35	20
,, with enlarged spleens ...	75	64
British Infantry Bazaar:—		
Percentage of infected children ...	52	42·3
,, with enlarged spleens ...	80	69

This table shows that a reduction occurred in both bazaars, but the relative numbers are for the Royal Artillery 1·75 to 1; while for the British Infantry it is as 1·23 to 1. Capt. James states that this shows that even a small reduction in the number of the Anopheles is sufficient to produce a reduction in the amount of malaria which is quite measurable.

The results obtained by removing the left battery syce lines were very striking. The former site was within 140 yards of an irrigation channel in which numerous Anopheles were breeding; adult insects were abundant in the houses. At that time 56·5 per cent. of the children were infected with malarial parasites. After removal not a single adult in these lines suffered from fever; parasites were only found in one child, or 4 per cent. of the total; no Anopheles were ever found in these tents.

(3) Admissions for malarial fever among the troops. All the

troops were regularly dosed with quinine during the year; care being taken to see that the quinine was actually swallowed by the men. Want of time prevented the other test, viz., the examination of a large number of blood films, from being carried out.

The average annual admission rate per 1,000 for Mian Mir is 663, while for the year 1902 it was only 269. Tables are given showing the monthly admissions for malaria during 1902 and 1901; the reduction is striking.

Capt. James, in concluding, points out that the destruction of mosquitoes is both difficult and expensive; although given a free hand as regards both expenditure and methods to be employed, he says that during the summer only a slight impression has been produced on the number of mosquitoes. Possibly the winter operations (destruction of every hybernating larva) may yield better results, but, unless a marked reduction can be produced during the ensuing year, he does not consider that it would be advisable to continue operations in Mian Mir during a third year.

Capt. James attaches great importance to the other operations, viz., the removal of infected children or their treatment by quinine. The latter measure, he thinks, could be easily applied to every place in which large numbers of native children are gathered together in the vicinity of European troops.

During 1901 all adult syces received a prophylactic dose of quinine twice a week, but it was stated that, in spite of this, great difficulty was experienced in getting the work done, on account of the large number of syces constantly sick with fever. During 1902 no quinine was given, yet there was scarcely a case of fever. Capt. James attributes this difference to the prophylactic treatment of the native children, who are the main sources of infection, with quinine, and in the case of the left battery syce lines to their removal from the range of Anopheles.

REPORT OF THE ROYAL COMMISSION ON THE WAR IN SOUTH AFRICA.

As the actual volumes of this important report are unlikely to be accessible to the majority of members of our Corps, while the evidence contained in their pages cannot fail to be of interest to our readers, we propose giving a *precis* of the evidence so far as it relates to medical organisation before and during the late campaign. For this summary, which is continued from p. 405, vol. i., we are indebted to Lieut.-Col. Edwin Fairland. It deals mainly with evidence regarding medical equipment.

II.

The attention of the Commissioners was called by the official witnesses to the fact that till the year 1897 the medical equipment "was very obsolete, some of it dating back to the Crimean War. In that year a Committee inquired into the matter, and as the result of their report it was thoroughly revised and brought up to date." "It would," said Col. Gubbins, "have been a perfect scandal if we had gone out with the equipment as it was before."

There appears to have been a difficulty before the war in obtaining proper accommodation for storing medical instruments and drugs. All medicines had to be kept in damp cellars of the Herbert Hospital, and to a great extent became useless, until a ward in the hospital was devoted to their storage. "The instruments were suffering and the medicines were perishing." Surg.-Gen. Jameson, who was then Director-General of the A.M.S., said that he had made frequent representations with regard to this matter, but that the necessary funds were not conceded, apparently for the same reasons as those which led to retrenchments in regard to the medical *personnel*. It is, however, probably true, as Col. Gubbins pointed out, that in a country like this, where almost everything can be obtained rapidly, it would be a mistake to store up great reserves either of articles like medicines or of those like hospital beds. He said, "Medical supplies are perishable articles, and as to Ordnance supplies, we might not go to war for twenty or thirty years, when they would be obsolete. I may mention, as an instance, that there was a pattern bedstead brought out in the time of the Crimean War, called "The Macdonald." We have got it in our hospitals still and we cannot get rid of it. I worked a table out some years ago to determine, judging by the normal waste, when we should get rid of it, and I think we found that it would take 1,100 years to work off the present stock."

Surg.-Gen. Sir W. Wilson said that the surgical instruments used in

South Africa were "very good," and that the medical officers were supplied, as a rule, with the most modern class of instruments. There was never any deficiency of medical supplies in South Africa, although difficulties of transport made it impossible sometimes to get them to the front. The dressings were the best "that ever accompanied an army in the field," and the medicines were made up in the most compact form possible. He also said "we were well up to the times in the medicines and drugs." He mentioned, however, one serious shortcoming, namely, the non-provision of pyjamas in which to clothe wounded men. He said: "When a man comes in, at present there are no clothes for him, although he may be deluged in blood, but according to the regulation there are no clothes to put him into." This defect was first met by the Red Cross Committee, and pyjamas were subsequently supplied by the Ordnance Department.

The evidence of the civilian medical men who had experience in the war leaves, on the whole, a less favourable impression of the medical equipment than does that of the official witnesses. Professor Ogston said that "the quantity and quality of the equipment prepared and supplied to the hospitals, field hospitals, and bearer companies were defective, and generally they were antiquated and badly organised," and he considered that the "whole system of drug supply had not been adequately thought out." Sir Frederick Treves said that the supplies furnished by the Medical Department "were certainly antiquated, and we were carrying about with us instruments which I should have thought would only be found in museums." He could not say that the equipment was "entirely antiquated," but it was below the level of that usual in civil practice. The instruments in many cases were very inferior to those used in civil life. He also said: "We took about medicines that were in bottles in the most cumbrous form, and that had been in the bottles for twenty years, possibly. It is really a serious complaint; we had to drag this useless chemist's shop all over the country, packed up in the most ludicrous and extravagant way. Tabloids, or any such concentrated preparations as are used now, would have put the whole outfit into a twelfth part of the space." "The equipment of the field hospital, of course, is based upon certain tabulated forms, and it is supposed to be quite complete in itself, and the result is this, that in the many journeys we had to make in Natal up to the Tugela and back again, we were dragging with us, I suppose, what amounted to tons of useless material. Every field hospital is hampered by a theoretically complete outfit, which has to be dragged to and fro all over the country, and it is an immense burden. We were dragging about things that under no circumstances would have to be used in South Africa; for example, the outfit of the field hospital is suitable for any climate in the world, from the Polar regions to the Equator; it is an exceedingly elaborate outfit; it is complete on paper, and that has to be dragged all over the country." He suggested that this difficulty

might be partly met in the field by having advanced medical depôts containing the supplies which were needed and no other.

Sir A. Fripp considered that, generally speaking, the instruments and appliances of the A.M.S. in South Africa were "quite adequate," though they were at first "old-fashioned." He thought that "surgery is a very secondary matter in the part that the medical profession ought to play in war now-a-days," and that the rough surgery necessary after a battle did not require any elaborate instruments. He attached far greater importance to the prevention of disease. He said that the A.M.S. did not understand the "enormous practical advantage of having steam disinfectors at each hospital—a modern article of medical equipment." He was the first to take out this apparatus.

Col. Gubbins said that at the beginning of the war there was a good reserve of hospital marquee tents, but that the present hospital tent is an "atrocious pattern" and could not be worse. Professor Ogston said the tent accommodation on Modder River was quite inadequate, and suggested that, as in the German Army, some movable huts for hospital purposes should have been provided.

With regard to ambulance waggons the same witness stated that those sent out were not suitable to South Africa. "They were old waggons . . . . and not the best. . . . They jolted, and were old-fashioned." They were not nearly so good as those used in the Russian and German armies, and were even inferior as compared with the Cape waggons. Sir Frederick Treves said: "The Boer had good ambulances, but an English ambulance is hardly fit to transport the sick: it is impossible for a well man to sit in it when it is moving rapidly." He said that the English ambulances were only suitable for a country with good roads, and that no light carts had been provided which could go rapidly across country to pick up a wounded man, or could follow a cavalry column. Surg.-Gen. Sir W. Wilson denied that the Boers had better ambulance waggons than the British, and said that one waggon, Mark 5, was a good one. He said that there was at first a deficiency of light vehicles and that "the situation was saved" by a gift of tongas sent from India,* and by the use of Cape carts captured from the enemy. Ambulances of a useful kind were sent from Canada and Australia. Both in respect of ambulances and other equipment the Colonial medical arrangements impressed witnesses favourably.

The evidence may, perhaps, be said to leave the impression that the Army Medical Service as a whole had not, either as regards *personnel* or equipment, been maintained at the high standard which in so vital a matter is essential. We do not mean by this any reflection on the devotion or ability of individual members, nor do we overlook the improvements in equipment to which Sir

* A gift from Khan Bahadur Dhanjibhoy, C.I.E., a Parsee gentleman.

W. Wilson and Col. Gubbins have testified. But the service was weak in numbers, and the opportunities of gaining experience in the modern methods were denied; while it seems clear that, at any rate in the early part of the war, perhaps owing to accumulations of stores at home, medical supplies were not always of the newest pattern, and parts of the equipment were comparatively antiquated.

We are glad to learn that in the last two years much energy has been devoted to improving this Service. In order to consider the necessary steps and to assist the Secretary of State an Advisory Board has been created. Some of the most eminent civilian medical authorities have given to it their voluntary services and much of their time. Sir Frederick Treves expressed his belief that the Army Medical Service would be made "the finest service in the world in time," when reforms in contemplation could be carried out.

It will be no doubt recognised that in a matter of this importance there should be no hesitation in sanctioning all requisite expenditure, especially in the matter of improved training of medical officers and the proper equipment of military hospitals. We desire to call attention to the statements of Sir A. Fripp and Sir F. Treves with regard to the unsatisfactory condition into which these hospitals had been allowed to fall in this country.

MINUTES OF EVIDENCE.

(Q. 185). Lord Kitchener said with regard to the Medical Service:—

"The criticisms on the Medical Service during the war were, in my opinion, unfair. An army marching in a new country cannot be supplied with medical appliances to meet more than the recognised proportion of sick and wounded.

"It is the old question of 'bullets or pills,' and the proportion laid down cannot be altered without affecting the efficiency of the Army. If, then, an epidemic amongst soldiers occurs, the Army, if distant from its base, cannot be at once prepared to meet it with every appliance, and with necessary accommodation, and special steps have to be taken to meet the contingency for which the Army is advisedly unprepared."

"At a moment of epidemic the Medical Service was severely criticised during the war. No doubt some mistakes were made, but I do not consider that on the whole the Medical Service was in any way inefficient, and in the later phase of the war the arrangements for sick and wounded were in every way admirable."

"The professional ability of medical officers is not entirely satisfactory. They do not seem to take sufficient advantage of local resources to supplement what the Army provides, and in my opinion the R.A.M.C. rather fails in point of administration, and a good deal too much stress is laid on the preparation of multifarious reports and on compliance with innumerable regulations. They should also understand that the medical side of their

profession comes first, though a soldierlike spirit of discipline is naturally required."

Lord Kitchener thought he had "a sufficiency of medical officers." This included the civilians, but "there would not have been anything like enough if there had been only the Army Medical Department."

(Q. 1459-1465). Col. Sir E. W. D. Ward, K.C.B., speaking of the duties of the various Headquarters Officers said :—

"The Director-General of the Army Medical Department, under the supervision of the Commander-in-Chief, is charged with (1) the administration of the medical establishments of the Army and of the R.A.M.C.; (2) sanitary questions relating to the Army (that was the duty formerly of the Quarter-master General); (3) the preparation of medical and sanitary statistical returns; (4) the supply of medical stores; (5) annual estimate for medical services; (6) necessary inspections to secure efficiency of the services under his control; (7) advising the Secretary of State as to the distribution of the R.A.M.C., as to the appointment of officers to and their removal from that Corps, and on other matters connected with his department."

". . . The Secretary of State has directed that in future the War Office Council shall be constituted as follows: . . . and the Director-General of the Army Medical Department for Medical and Sanitary Questions." "Of course the additions to the new Council were the Director-General of Mobilisation and Military Intelligence and the Director-General of the Army Medical Department for his own special services . . ."

(Q. 1496). What is the function of an Advisory Board? "Well, the Advisory Board primarily is responsible for the organisation of the Medical Service, that it is kept up to the proper pitch of perfection, and so on. We have got, in addition to the Military members, five members of the civil profession, and the Nursing Board is on the same lines."

(Q. 1497). I suppose it has no Executive functions? "No. They are Executive in one way, as regards the inspection of hospitals now; a civil member of the Advisory Board and a Military Member of the Advisory Board pay surprise visits to the various hospitals, and inspect them together."

(Q. 1651). Do you not think, Sir Henry (Brackenbury), as a matter of fact, that the khaki serge did not become a matter of importance until the cold weather was coming on in the following spring?

"That was a matter in which we were guided by the Director-General of the Army Medical Service, and he was pressing for khaki serge whether it was summer or winter, instead of khaki drill, considering that the former was more healthy. He laid tremendous stress on wet."

(Q. 1652). I quite understand it was not your department that initiated it; it came from the Medical Service? It came from the Adjutant-General, urged by the medical people.

(Q. 1653). And you merely had to satisfy the demand? That is so.

The Director-General of the Army Medical Service considered khaki drill dangerous to health in such a climate.

(Q. 3493). Col. Sir N. B. Richardson, K.C.B., examined: I think you wish to represent that there were no deficiencies of supplies for hospital use?

"In May and June, 1900, a great many letters appeared in the papers, and there was a deal of fuss about the sickness amongst the troops, and different people said that there was a want of supplies. Of course they meant supplies generally, and hospital supplies include equipment, machines, instruments, and appliances, as well as food supplies. The Army Service Corps had only to do with the 'food' supply for the hospital, the brandy, port wine, &c. I had largely increased the supply of medical comforts from time to time when I found the consumption was in excess of the scale that had been fixed by the Director-General before I went out, and that was done with the concurrence of the Principal Medical Officer. On June 9 I wrote to the P.M.O. Lines of Communication: 'Will you please let me know if any special kinds of supplies beyond those already in use or cabled for are required in the hospitals. We have cabled home for Brand's Essence of Beef, Benger's Food and claret, also that the supplies of meat extracts, brandy, champagne, and calves' foot jelly should be doubled, as the demands for these supplies are far in excess of the scale fixed by the Director-General A.M.S., and published in orders. Should, however, you consider any other articles of supply are wanted, we could write home for them by Wednesday's Mail, cabling at the same time if urgent.' That is signed by myself, and this is the reply: 'Director of Supplies,—I do not consider anything more than what has been asked for is likely to be required. (Signed) J. F. Supple, Colonel R.A.M.C., P.M.O., Base, Cape Town, June 11, 1900.' I wrote that letter with the object of finding out whether there was anything in these complaints, and whether there was really anything more wanted than was supplied."

(Q. 3494). There may have been particular cases of some deficiency?

"No doubt. You will find that doctors vary in their treatment. You have so much port wine and brandy per thousand sick men, and you fix a scale, as the Director-General in London did, but one doctor at a station says, 'I never give anything but brandy to my patients,' and you find a large quantity of surplus port wine at that station, with telegrams going down for more brandy. At another place the doctor will say, 'I never give spirits; I always give port wine,' and the patients get nothing but port wine, and there will be a run on the port wine. Another doctor will use nothing but essence of beef, and will not touch extract of beef."

(Q. 3495). I suppose in a case like the march to Bloemfontein you could not carry these things?

"We never ran out, and I always had some supplies all through the march to Bloemfontein. I may have run out of, say, whisky, but I am

perfectly certain that when I got into Bloemfontein I still had some brandy, port wine, arrowroot, and essence of beef.

(Q. 3496). And those were the main supplies you were responsible for?

"Yes, the doctors supply themselves with medicines. I remember I made a full report, with supporting documents to the Royal Commission appointed to consider and report upon the care and treatment of the sick and wounded in the S. African campaign, and that report could be obtained in which I showed that from the week we arrived in Bloemfontein straight on, the reserve of hospital supplies at Bloemfontein was constantly increased. Directly we got to Bloemfontein I took everything there was in the town; I commandeered everything at fair prices that we fixed, and we got everything we could. As far as my supplies went, the reserve quantity on which the medical officers could always draw was increasing instead of diminishing."

(Q. 3557). There has been a good deal said about the men's teeth being ruined, and to my knowledge there have been hundreds of cases mentioned where that was said to be caused by the hardness of the biscuits; that is not your opinion?

"I do not think so. I think it is entirely a question of liver or stomach. I think the men's stomachs get affected probably by the cold, and that acted on their teeth. I remember several men telling me that their gums ached, and they had to burn them with alum or caustic. Their teeth were loose, and I think it was probably more a kind of scurvy than anything else. My teeth kept all right. I have eaten lots of biscuits, and I have been ten years in S. Africa, and in five expeditions there."

(Q. 3558). You think it is a case of the men's digestion going?

"Yes, I think the digestion goes first, and then the teeth go; not the other way about."

(*To be continued.*)

Reviews.

PROPHYLAXIE DU PALUDISME. Par le Dr. A. Laveran. Pp. 206. Paris: Masson et Cie., éditeurs.

To those whose work brings them much in contact with malaria we can strongly recommend the little volume published by Dr. A. Laveran on the prophylaxis of malaria. In a very concise and clear style he has summated all the recent work on the propagation of malaria by mosquitoes, and upon the methods which have proved of most service in combating this disease.

The book is divided into two parts, the first dealing with the malaria parasites as they occur in man and in the mosquito, the proofs of mosquito transmission of the disease, and the biology of the *Culicidæ*. We note that Dr. Laveran adheres to his well-known views as to the unity of malaria, but admits that there are three varieties of what he regards as a single species corresponding to the benign tertian, malignant tertian and quartan parasites. The second part, dealing with the prophylaxis of malaria under the heads of (1) destruction of mosquitoes, their eggs and larvæ; (2) protection of the individual against the bites of mosquitoes, and (3) protection by quinine, is most instructive and suggestive, giving, as it does, a *résumé* of the methods employed and the results obtained under very varied conditions in all parts of the world. It is full of practical points and suggestions which should prove of the greatest use to those who are called upon to organise or carry out preventive measures against malaria.

The value of the work is enhanced by the numerous references to the literature bearing on the subject.

W. B. LEISHMAN.

THE PRACTICAL STUDY OF MALARIA, AND OTHER BLOOD PARASITES. By J. W. W. Stephens, M.D.Cantab., D.P.H., and S. R. Christophers, M.B., I.M.S. Published for the University Press of Liverpool by Longmans, Green and Co., 39, Paternoster Row, London, New York, and Bombay, 1903. Pp. 378. 10s. 6d. net.

The object of this book is stated in the introduction as follows: "In the authors' experience many medical men in the tropics are only deterred from undertaking researches in tropical diseases by the impossibility of obtaining the necessary knowledge of methods apart from personal instruction in some laboratory. Numerous works on technique exist; they are, however, more adapted for work in a laboratory than for the conditions under which the average practitioner in the tropics must be prepared to conduct his researches. As a result of an experience of several years, during our work on the Royal Society's Commission on Malaria, of the difficulties that Indian and Colonial Medical Officers experience in making the first start in what must often be work of the greatest interest to themselves and of the utmost value to science, we have deemed it wise to give instead of full and elaborate technique, as usually

given, only that which we have found the best, the simplest, and the most generally useful. In reality, the necessary methods required to undertake research of the highest value in malaria are very simple, yet most of these cannot be found in books, and they are with considerable difficulty learnt except by the personal direction of those who are familiar with the small details which go to make success.

"In the present handbook we propose to give the essentially practical methods, by which those not familiar with laboratory methods may, under their own microscopes, follow all the most recent work on malaria, and eventually be in a position themselves to add new facts to our knowledge of this important disease.

"For instance, with very little apparatus it is possible to undertake many most important researches, *e.g.*, to work out the rationale of infection in any station or cantonment; the form of the parasite present; the percentage of adults and children infected; the species of Anopheles; where each species is found and where it breeds; the percentage of each species carrying sporozoites and zygotes. In fact, nearly the whole technique of malaria can be conducted with a microscope, a few slides and cover-glasses, a needle, a stain, some tubes, pins, and cardboard. (*Vide* Appendix.)

"While our original intention was to write a practical guide to malaria study solely, yet the opportunity for research on other blood parasites are so numerous in the tropics, that we have thought it to be of practical value to add short supplementary chapters on other hæmatozoa and on the Trypanosomidæ, &c."

There can be no doubt that the object of this book is excellent, and the authors are doubtless well equipped for the writing of it by their several years of hard practical work in Africa and India. Dr. Christophers is still continuing the work, and we are impatient to hear from him the result of the important Mian Mir experiment, which if carried out to a conclusion should demonstrate once for all our power of controlling malaria in an Indian cantonment. It is to be hoped that nothing will interrupt the Indian Government in carrying this crucial experiment to an end. It appears to us that there is a danger that the experiment is being made to carry too many issues, the destruction of mosquitoes, the removal of natives from the vicinity of Europeans, and the giving of quinine as a prophylactic. If the experiment is successful there will surely be a difficulty in apportioning the proper share of credit to the different methods.

But we speak without any local knowledge. In the lay press at present we meet almost daily with accounts of campaigns against mosquitoes which would lead the unwary to believe that the control of malaria was one of the simplest things in preventive medicine. But James' last report to the Royal Society in the Mian Mir experiment does not bear out this optimistic opinion by any means. But to return to the book. It is divided into twenty-eight chapters—two on the examination of blood, four on the malaria parasites, sixteen on mosquitoes, two on malaria itself and one on blackwater fever. Chapters XXVI., XXVII., XXVIII., describe other blood parasites, the piroplasmata, the trypanosomata, the filaria, &c. The book bears the marks of having been hurriedly put together, but this will doubtless be remedied in

a future edition. To aid in this we may be pardoned if we point out a few places where improvement is possible. In the section on fixing films there is no mention of what we consider the most rapid and the cleanest method of fixing blood films, namely, the action of osmic acid vapour. A glass stoppered bottle with a few dry crystals of osmic acid in the bottom, and a momentary exposure of the slide or slip to the unstoppered mouth, is all that is required.

Leishman's stain, which we have found the most useful and simplest of all stains we have ever used, in fact a child can use it and get the best results, is described, but it must be noted that the methyl alcohol which is used as a solvent is not meth. spirit, but must be March's methyl alcohol "puriss. pro analyse" (acetone free).

When we think of the crude results we got a few years ago in the staining of blood films containing trypanosomes with carbol. fuchsin compared with the beautiful specimens easily got by staining with Leishman's, we are forced to confess that year by year there is a great advance in our methods towards simplicity and efficiency.

On page 22, para 4, in our opinion these large open mesh works of nuclear matter are seen in every film and are due to mechanical violence in the making of the specimens. On page 29, under flagellation, it may be pointed out that there are no crescents in simple tertian.

The chapters on mosquitoes, their anatomy, classification and identification, are very well done and ought to be of great use to medical officers serving in malarious countries. The chapter on the identification of the Anopheles is especially praiseworthy.

In the chapter on trypanosomes the tsetse flies are pitchforked into the centre of it without much apparent reason, causing the description of *Trypanosoma Evansi* to be given twice in identical terms on pages 349 and 155. These are, however, small errors easy to put right. On the whole we can thoroughly recommend this book to medical officers who wish to take up the study of malaria, and we strongly advise every R.A.M.C. officer in malarious countries to take up the study, as few diseases are of so much importance to the soldier as malaria.

D. BRUCE.

Corps News.

EXTRACTS FROM "LONDON GAZETTES."

Army Medical Staff.

Surg.-Gen. G. J. H. Evatt, M.D., C.B., is placed on retired pay, dated November 11, 1903.

Surg.-Gen. Thomas O'Farrell, M.D., is placed on retired pay, dated November 20, 1903.

Col J. D. Edge, M.D., C.B., Royal Army Medical Corps, to be Surg.-Gen., *vice* G. J. H. Evatt, M.D., C.B., retired, dated November 11, 1903.

Royal Army Medical Corps.

The undermentioned Lieuts. to be Capts., dated November 14, 1903 :—

W. J. Waters, H. F. Shea, M.B., C. E. Fleming, M.B., P. J. Bodington, M.B., J. F. Whelan, M.B., P. S. Lelean, W. H. Odlum, F. A. Stephens, M. G. Sterling, W. M. Power, J. T. Johnson, M.D., E. F. Q. L'Estrange, R. B. Black, M.B., T. B. Unwin, M.B.

Lieut.-Col. J. J. Morris, M.D., to be Col., *vice* J. D. Edge, dated November 11, 1903.

Lieut.-Col. H. Grier is placed on temporary half-pay on account of ill-health, dated November 20, 1903.

The undermentioned Lieuts. to be Capts, dated November 29, 1903 :—

H. J. McGrigor, M.B., W. R. P. Goodwin, J. H. Brunskill, M.B., A. C. Duffey, M.D., A. W. Gibson, C. D. Myles, M.B., R. N. Hunt, M.B., H. E. J. A. Howley, R. F. M. Fawcett, W. L. Steele, H. A. Davidson, M.B., J. W. West, M.B., W. Riach, M.D., H. R. Bateman, H. G. Pinches, T. White, J. C. Kennedy, M.B., A. R. C. Parsons, J. B. Cautley, W. M. B. Sparkes, S. B. Smith, M.D., E. W. Powell, J. L. Jones, E. S. Worthingson ; dated November 30, 1903.

The undermentioned Lieuts. are confirmed in that rank :—

J. M. M. Crawford, G. Bramhall, T. E. Harty, H. H. Swanzy, J. E. Skey, H. T. Stack.

The name of Lieut. Joseph Edward Henry Gatt, M.D., is as now described, and not as stated in the *Gazette* of February 3, 1903.

Lieut.-Col. J. Riordan, M.B., retires on retired pay, dated December 12, 1903.

Army Medical Reserve of Officers.

Surg.-Lieut. A. L. Jones to be Surg.-Capt., with precedence next below J. P. S. Ward, dated November 11, 1903.

Surg.-Major G. D. P. Thomas having resigned his Volunteer appointment, ceases to be an officer in the Army Medical Reserve of Officers.

Surg.-Major H. Wright having resigned his Volunteer appointment, ceases to be an officer in the Army Medical Reserve of Officers.

Surg.-Capt. E. Gray, 2nd Cheshire Royal Engineers, Railway Volunteers, to be Surg.-Capt., dated December 12, 1903.

Memorandum.

The King has been graciously pleased to give directions for the following appointment to the Most Distinguished Order of Saint Michael and St. George :—

To be Ordinary Member of the Third Class, or Companion of the said Most Distinguished Order: Capt. Thomas Henry Matthers Clarke, M.B., D.S.O., for services in Crete.

Imperial Yeomanry.

Lovat's Scouts.—Surg.-Lieut. J. R. Kennedy, M.B., resigns, dated November 14, 1903.

Scottish Horse.—The appointment of David Mitchell Macdonald, M.B., to be

Surg.-Lieut., which was announced in the *London Gazette* dated October 23, 1903, is cancelled.

Surg.-Lieut. David Mitchell Macdonald, M.B., from the 5th (Perthshire Highland) Volunteer Battalion, the Black Watch (Royal Highlanders), to be Surg.-Lieut., dated October 24, 1903.

VOLUNTEER CORPS.

1st Devonshire and Somersetshire Royal Engineers.—Surg.-Capt. J. Fuller to be Surg.-Major, dated November 14, 1903.

2nd Lancashire (the St. Helen's) Royal Engineers.—Surg.-Lieut. E. H. Monks to be Surg.-Capt, dated November 14, 1903.

2nd Volunteer Battalion the Lincolnshire Regiment.—Surg.-Capt. S. H. Perry resigns his Commission, dated November 14, 1903.

3rd Volunteer Battalion the Prince Albert's (Somersetshire Light Infantry).—Percy George McReddie, Gent., to be Surg.-Lieut., dated November 14, 1903.

Surg.-Lieut.-Col. R. A. Prichard resigns his Commission, and is granted the honorary rank of Surg.-Col., with permission to wear the uniform of the Battalion on retirement, dated November 14, 1903.

1st Volunteer Battalion the Hampshire Regiment.—Surg.-Capt. H. M. Brownfield, from 3rd (Duke of Connaught's Own) Volunteer Battalion the Hampshire Regiment, to be Surg.-Capt., dated November 14, 1903.

5th (Isle of Wight, Princess Beatrice's) Volunteer Battalion the Hampshire Regiment.—William Henry Harland, Gent., to be Surg.-Lieut., dated November 14, 1903.

2nd Volunteer Battalion the Essex Regiment.—Surg.-Lieut. J. E. Molson, M.B., to be Surg.-Capt., dated November 14, 1903.

3rd Durham Royal Garrison Artillery.—Surg.-Lieut. J. H. Hunter, M.D., to be Surg.-Capt., dated November 21, 1903.

Surg.-Major F. W. Sinclair, M.B., resigns his Commission, dated November 21, 1903.

1st Norfolk Royal Garrison Artillery.—Richard Wilson Mullock, Gent., to be Surg.-Lieut., dated November 21, 1903.

2nd Volunteer Battalion the Royal Sussex Regiment.—Surg.-Lieut. P. J. La Riche to be Surg.-Capt., dated November 21, 1903.

1st Volunteer Battalion the Hampshire Regiment.—Herbert James Godwin, Gent., to be Surg.-Lieut., and to be borne as supernumerary whilst doing duty with the Hampshire Volunteer Infantry Brigade Bearer Company, dated November 21, 1903.

3rd (Dundee Highland) Volunteer Battalion the Black Watch (Royal Highlanders).—Surg.-Capt. W. S. Malcolm, M.B., resigns his Commission, dated November 21, 1903.

1st Volunteer Battalion the East Lancashire Regiment.—Surg.-Lieut. A. Foster, M.D., resigns his Commission, dated November 28, 1903.

2nd Volunteer Battalion the Royal Sussex Regiment.—Surg.-Lieut. G. R. R. Paine resigns his Commission, dated November 28, 1903.

1st Bucks.—Surg.-Capt. J. Shaw, M.D., resigns his Commission, dated November 28, 1903.

1st Nottinghamshire (Robin Hood).—Capt. R. P. Shearer resigns his Commission, and is appointed Surg.-Lieut., dated November 28, 1903.

1st Tower Hamlets.—Surg.-Lieut. J. F. F. Parr to be Surg.-Capt., dated November 28, 1903.

1st Cinque Ports Royal Garrison Artillery.—Surg.-Capt. J. B. Berry to be Surg.-Major, dated December 12, 1903.

6th Lancashire Royal Garrison Artillery.—Francis William Bailey, Gent., to be Surg.-Lieut., dated December 12, 1903.

Galloway.—Surg.-Capt. J. Cowan, M.B., resigns his Commission, dated December 12, 1903.

1st Volunteer Battalion the Dorsetshire Regiment.—Charles Percival Allen, Gent., to be Surg.-Lieut., dated December 12, 1903.

3rd Volunteer Battalion the Welsh Regiment.—Charles Richardson White, Gent., to be Surg.-Lieut., dated December 12, 1903.

3rd (Dundee Highland) Volunteer Battalion the Black Watch (Royal High

landers).—Surg.-Major W. Kinnear, M.B., is borne as supernumerary whilst commanding the Black Watch Volunteer Infantry Brigade Bearer Company, dated December 12, 1903.

1st Middlesex (*Victoria and St. George's*).—Surg.-Lieut.-Col. F. E. Fenton resigns his Commission, with permission to retain his rank and to wear the prescribed uniform on retirement, dated December 12, 1903.

3rd (*Renfrewshire*) *Volunteer Battalion Princess Louise's* (*Argyle and Sutherland Highlanders*).—Surg.-Lieut. W. A. Pride, M.B., to be Surg.-Capt., dated December 12, 1903.

7th Middlesex (*London Scottish*).—Surg.-Major J. Cantlie, M.B., to be Surg.-Lieut.-Col., dated December 12, 1903.

ROYAL ARMY MEDICAL CORPS VOLUNTEERS.

The Glasgow Companies.—William Bryce, M.D., to be Lieut., dated November 14, 1903.

The Edinburgh Company.—Major D. Hepburn, M.D., resigns his Commission, with permission to retain his rank and to wear the prescribed uniform on retirement, dated November 28, 1903.

The Glasgow Companies.—Capt. J. G. Graham, M.B., resigns his Commission, dated November 28, 1903.

The Manchester Companies.—Quarter-Master F. W. Walker resigns his Commission, dated November 28, 1903.

Charles Gordon Stoddard, Gent., to be Quarter-Master, dated November 28, 1903.

The London Companies.—Major H. W. Dodd resigns his Commission, with permission to retain his rank and to wear the prescribed uniform on retirement, dated December 12, 1903.

Lieut. H. Fulham-Turner to be Capt., dated December 12, 1903.

VOLUNTEER INFANTRY BRIGADE BEARER COMPANIES.

Worcester and Warwick.—Lieut. A. H. McDougall resigns his Commission, dated November 28, 1903.

The Black Watch.—The undermentioned gentlemen to be Lieuts.:—

David Rorie, dated December 12, 1903; Alexander Edward Kidd, dated December 12, 1903.

EXCHANGES have been permitted between Major C. W. Reilly and Capt. L. P. More; Capts. J. G. Berne and F. R. Buswell; Lieut.-Col. J. D. T. Reckitt and Major A. J. Luther; Lieut.-Cols. E. O. Wight and A. S. Rose.

ARRIVALS HOME.—From Crete: Capt. T. H. M. Clarke, C.M.G., D.S.O. From India: Lieut.-Cols. M. W. O'Keeffe, A. A. Pechell, J. Battersby, C. R. Tyrrell, P. Mulvany, W. Dugdale; Majors J. Fayrer, W. S. Boles, D. Hennessy, R. W. H. Jackson, A. E. Morris, L. T. M. Nash, and R. J. Windle; Capts. L. F. Smith, H. W. Grattan, J. H. Campbell, E. C. Hayes, J. V. Forrest, A. H. Waring, E. W. Bliss, G. B. Riddick, M. Swabey, and R. W. Clements. From Malta: Major D. M. O'Callaghan.

On Leave.—Lieut.-Col. H. J. R. Moberly; Capts. W. W. O. Beveridge, E. Bennett, and V. J. Crawford.

POSTINGS.—Major J. Fayrer to Home District.

Lieut.-Col. M. W. O'Keeffe to Woolwich, for charge of Medical Division, Royal Herbert Hospital.

Major A. E. Morris to Woolwich.

Lieut.-Col. W. Dugdale to Netley.

Lieut.-Col. J. B. Emerson, Majors L. T. M. Nash and D. M. O'Callaghan to Southern District.

Capt. S. H. Fairrie to South Eastern District.

Lieut.-Cols. A. A. Pechell and J. Battersby, Majors R. J. Windle, W. S. Boles, R. W. H. Jackson and D. Hennessy to Ireland.

EMBARKATIONS. — India: Surg.-Gen. W. L. Gubbins, M.V.O.; Col. G. D. N. Leake; Lieut.-Cols. J. C. Howlett and T. P. Woodhouse; Majors S. J. W. Hayman, T. G. Lavie, J. J. Russell, H. Carr, J. Fallon, M. J. Sexton, J. J. C. Donnet, R. J. A. Durant, and S. C. Philson; Capts. N. Tyacke, W. G.

Beyts, G. J. Houghton, R. T. Brown, and C. H. Carr; Lieuts. J. A. Balck, P. Davidson, D.S.O., G. A. K. H. Reed, R. B. Ainsworth, H. V. Bagshawe, S. B. Smith, N. E. J. Harding, and S. M. W. Meadows. Bermuda: Col. E. H. Fenn, C.I.E., and Lieut.-Col. G. E. Weston. Canada: Major J. R. Mallins. North China: Lieut.-Col. W. G. Macpherson, C.M.G., and Captain H. S. Thurston. South China: Lieut.-Col. G. J. Coates, Major C. S. Sparkes, and Capt. J. T. Johnson. Cyprus: Capt. B. W. Longhurst. Egypt: Lieut.-Col. O. Todd; Majors J. B. Wilson and F. W. Hardy; Capt. H. C. French. Ceylon: Major C. J. Healy and Lieut. D. S. Skelton. West Coast of Africa: Lieut. E. F. Q. L'Estrange. South Africa: Col. J. C. Dorman, C.M.G.

SPECIAL PROMOTION.—The undermentioned Lieut.-Col. to be Colonel:—

David Bruce, F.R.S., M.B., R.A.M.C., in recognition of his services in investigating the cause of the "Sleeping Sickness" in Uganda, as well as in consideration of the distinction already attained by him in researches connected with Malta fever and tsetse-fly disease. Dated December 10, 1903. (From the *London Gazette*, December 18, 1903.)

Sir William Taylor desires to congratulate the Editor of the Journal, and to convey to the Officers of the Corps an expression of the pleasure he had in recommending Col. Bruce to the Commander-in-Chief for the first brevet promotion ever awarded for distinction in original research.

The promotion has been approved by His Majesty in recognition of the valuable services which Col. Bruce has rendered to scientific medicine, not only in connection with his recent investigations in Uganda, which have established the causal relation between a trypanosome and sleeping sickness, but also for the distinguished reputation which he has established in the domain of tropical pathology. His discovery of the specific organism associated with Malta fever (the *Micrococcus Brucei*) was a brilliant piece of scientific work, carried out under difficult circumstances in the early days of bacteriological pathology. More recently he has become even more distinguished as the discoverer of the parasite of Nagana or tsetse-fly disease (known as *Trypanosoma Brucei*), for which work he was elected a Fellow of the Royal Society.

SPECIAL APPOINTMENT.—Lieut. G. W. Smith, R.A.M.C., is about to be seconded for service under the Foreign Office and has been appointed a Medical Officer in the East Africa and Uganda Protectorates for special duty in connection with further investigations of sleeping sickness.

CASUALTIES, &c., from November 11 to December 10, 1903, inclusive:—

CORPS ORDERS by Surg.-Gen. Sir W. Taylor, M.D., K.C.B., K.H.P., Director-General Commanding.

Headquarters, War Office,
November 12, 1903.

No. 1.—The Director-General has much pleasure in publishing, for the information of the whole Corps, the following extract from the *London Gazette*, No. 27,596, dated September 11, 1903:—

The King has further been pleased to approve of the grant for the Medal for Distinguished Conduct in the Field to the undermentioned soldiers:—

Staff-Sergt. G. C. W. King, Royal Army Medical Corps. (This refers to No. 10046 2nd Class Staff-Sergt. G. C. W. King.)

Promotions.

No. 2.—The following promotions, to complete establishment, will take effect from the dates specified:—

Lance.-Sergeant to be Sergeant. Date of Casualty, 9.9.03.—7,015 Haddon, T., on being posted to the 2nd S.E.D. Co. R.A.M.C. (Militia) for duty, in accordance with Para. 1,863 King's Regulations.

Lance-Sergeant to be Sergeant. Date of Casualty, 5.10.03.—9,176 Power, F., on being posted to the N.E.D. Co. R.A.M.C. (Militia) for duty, in accordance with Para. 1,863 King's Regulations.

Lance-Sergeants to be Sergeants. Date of Casualty, 10.11.03.—9,903 Pack, R. T., special as Clerk; 11,303 Ashton, R.; 7,213 Webb, J. M., special as Laboratory Attendant; 8,136 Piercy, G.; 8,883 Fowler, A.; 8,808 Davies, C.; 11,182 Dean, F.; 10,074 Wilkins, H.; 10,407 Vickers, J.; 10,106 Gooding, E.; 11,338 Grove, W.; 11,441 Sprinks, H.; 11,029 Spowage, A.

To be Corporals.

Corps No.	Rank and Name.		Date of Casualty.	Corps No.	Rank and Name.	
9,207	Lce.-Cpl.	Hillier, N.	10.11.03	10,620	Lce.-Cpl.	Lovell, E. F.
7,851	,,	Malone, H.		10,965	,,	Howlett, J.
9,405	,,	Valance, C.		11,465	,,	Inkpen, H. G
10,209	,,	Triggs, E.		11,732	,,	Hattam, H. S.
11,211	,,	Marsden, L. T.		11,673	,,	Ruddell, J.
11,524	,,	Martin, G.		15,619	,,	Preston, E.
11,582	,,	Ryan, J.		12,623	,,	Rolfe, H. S.
12,038	,,	Garlich, I. H.		12,816	,,	Bell, D. J.
12,987	,,	Walter, B.		16,811	,,	White, O.
15,515	,,	Waters, A.		13,726	,,	Sanderson, J. S.
14,851	,,	Willsher, C. B.		14,338	,,	McDonald, J. M.
14,926	,,	Hunt, W. H. G.		14,503	,,	Pottinger, G.
15,948	,,	Christie, G. D.		14,663	,,	Snow, P.
9,134	,,	Ladwick, H.		15,481	,,	Middleton, W. H.

Appointments.

No. 3.—The following appointments to Lance rank will take effect from the dates specified :—

To be Lance-Sergeants.

Corps No.	Rank and Name.		Date of Casualty.	Corps No.	Rank and Name.	
10,879	Corporal	Fenton, E. A.	10.11.03	10,991	Corporal	Pratt, E.
11,272	,,	Holmes, B.		11,173	,,	Hazell, C. J.
11,603	,,	Clegg, W.		11,353	,,	Lackey, M. E.
15,598	,,	Barnes, J.		15,975	,,	Harris, D.
11,843	,,	Baxendale, J.		15,892	,,	O'Connor, J.
14,516	,,	Barnes, C. H.		10,333	,,	Martin, T.
10,849	,,	Richmond, C. E.T.		10,892	,,	Reeve, H. J.

Privates to be Lance-Corporals. Date of Casualty, 10.11.03.—5,783 Hawkins, H. 9,565 Lane, P.; 9,708 Hughes, A.; 9,728 Aspinall, W. H.; 10,709 Fitzgerald, T.; 10,936 Lake, H. T.; 10,941 Moody, T.; 12,535 Oliver, T. E.; 12,620 Kirby, T.; 18,371 Woods, H.; 14,621 Smith, R.; 14,685 Crafer, F. S.; 14,735 Cox, J. A. C.; 15,952 Brunton, P. A.; 15,230 Conway, P.; 15,436 Scruby, T.; 15,634 Drummond, W. H. E.; 17,843 Blair, R. C.; 15,970 Warren, C. R.; 15,980 Anderton, A. G.; 16,287 Saunders, W. E.; 17,230 Mann, J.; 17,273 Jones, W. H.; 17,430 Wood, W. H.; 17,500 White, R. R.; 18,094 Burns, W.; 17,702 Winterhalder, C. J., special as Laboratory Attendant.

Advancement of Privates.

No. 4.—The following advancements in rate of Corps Pay will take effect from the dates specified :—

To be advanced to the 2nd rate of Corps Pay (8d).

No.	Name.	Date.	Remarks.
11,153	Woods, S.	1.8.03	As Orderlies.
11,614	Howard, W. H.		
11,807	Levey, J.		

To be advanced to the 3rd rate of Corps Pay (6d.).

No.	Name.	Date.	Remarks.
16,933	Wareing, T.	1.8.03	As Cooks.
16,944	Luff, A. H.		
16,263	Rand, G. S.		
12,995	Lawrence, C.	1.8.03	As Orderlies.
17,933	Dean, D. E.		
17,644	Hart, H. E.	1.8.03	As Clerk.
14,671	Brunton, E. W.	1.11.03	As Cooks.
8,973	Walker, A.		
11,895	Higgins, J.		
12,209	Eccles, A.		
14,662	Taylor, C. E.		
14,720	Dodd, G. J. H.		
16,666	McConaghie, W. J.		
17,275	Wheeler, G. H.		
17,905	Cornell, E.		
18,934	Thomas, F.	1.11.03	As Orderly.

No. 5.—The following Special Corps Orders are published for information :—

September 8, 1903.

Promotion Cancelled

The promotion of No. 9,970 Lce.-Corpl. C. Fitzgerald to be Corpl., which appeared in Corps Orders dated February 18, 1903, is hereby cancelled. This Non-Commissioned Officer was on gratuity furlough at the time the promotion was made, and it has been decided that Non-Commissioned Officers and men while on gratuity furlough, prior to passing to the Reserve, are not eligible for further advancement in their Corps during such furlough.

(Authority : 19 A.M.C. 2664.)

September 19, 1903.

Appointment.

No. 17,128 Boy F. G. Fuller is appointed a bugler from this date, inclusive.

October 15, 1903.

Remission of Sentence.

The Commander-in-Chief has been pleased to remit the sentence of reduction which was passed upon No. 9,088 Sergt. C. Parnell, on November 3, 1900, in consideration of this Non-Commissioned Officer's gallant conduct in the Field.

(Authority : 110 A.M.C. 177, dated September 26, 1903.)

November 11, 1903.

Surplus Arms and Equipment.

It has been brought to the notice of the Director-General that in some cases when Non-Commissioned Officers and men have been transferred from the Royal Army Corps Depôt, Aldershot, to companies at home and detachments abroad, who were not in possession of arms, in consequence of the supply at the Depôt having been temporarily exhausted, they have been equipped from surplus stock held on charge at the stations to which they were posted. Consequently, when the arms have been afterwards received from the depot they have been returned as not being required, the result being confusion in the numbering of both arms and accoutrements.

The Officer Commanding Depôt reports that in all these cases information was sent that the arms would follow as soon as they were received from Woolwich. This confusion would not have occurred if Para. 130, Equipment Regulations, had been strictly complied with.

All surplus arms and accoutrements should be transmitted in transit from time to time as directed in that paragraph, and the Officer Commanding Depôt informed accordingly; the only exception being that at stations abroad officers commanding detachments may keep a small stock of surplus arms and accoutrements if there is a probability of vacancies being filled up locally in accordance with Para. 131.

If the provisions of the Equipment Regulations are not complied with in future, officers commanding will be held responsible for the waste of money that results from the retention of arms contrary to the regulations.

Officers commanding should at once take steps to re-mark all accoutrements in use to correspond with the arms in possession of Non-Commissioned Officers and men.

Promotions Cancelled.

No. 6.—The promotion to Sergt. of No. 8,391 Lce.-Sergt. F. T. Foote, notified in Corps Order 1 of June 12, 1903, is hereby cancelled.

Appointments Cancelled.

No. 7.—The appointments to Lce.-Corpl. of No. 14,770 Pte. A. Buckner and No. 14,817 Pte. C. Marsden, notified in Corps Order No. 2 of August 1, 1903, are hereby cancelled.

Good Conduct Medals.

No. 8.—Silver Medals for Long Service and Good Conduct have been awarded as follows :—

UNDER APPENDIX TO ARMY ORDER 68 (*a*) OF 1903 :

With Gratuity.

No. 6,263 1st Cl. Staff-Sergt. J. A. Sykes.

No. 6,314 1st Cl. Staff-Sergt. E. T. Smith.

No. 6,343 1st Cl. Staff-Sergt. H. J. Dudman.
„ 6,062 Lce.-Sergt. A. Smith.
No. 6,278 2nd Cl. Staff-Sergt. T. Johnstone.
„ 6,568 Pte. W. Shaw.

Without Gratuity.

No. 5,966 Sergt.-Major J. Dodds.
„ 5,080 „ H. E. Hallowell.
„ 6,224 „ W. Davies.
„ 6,210 „ G. W. S. Bush.
„ 6,365 „ H. B. Wall.
„ 5,444 „ F. Soule.
No. 7,236 Sergt.-Major C. B. Thompson.
„ 5,901 „ C. E. Phillips.
„ 5,413 „ A. Collins.
„ 6,891 „ A. Fowler.
„ 5,277 „ A. R. Titchener.
„ 3,722 „ F. Evans.

UNDER APPENDIX TO ARMY ORDER 172 (*c*) OF 1903:

With Gratuity.

No. 6,622 2nd Cl. Staff-Sergt. E. Ross.
„ 5,738 Sergt. T. H. V. Coad.
„ 7,558 1st Cl. Staff-Sergt. T. Hedley.
„ 7,558 1st Cl. Staff-Sergt. T. Hedley.
„ 6,648 „ „ R. Hughes.
„ 6,693 Pte. W. H. Brown.
„ 11,420 „ E. McCormack.
„ 5,470 „ J. M. Wheeler.
No. 6,380 1st Cl. Staff-Sergt. F. E. Thurgate.
„ 6,658 1st Cl.Staff-Sergt.P.Plunkett.
„ 6,274 Pte. W. Brogden.
„ 6,367 1st Cl. Staff-Sergt. W. Shannon.
„ 6,700 1st Cl. Staff-Sergt. J. Wright.
„ 6,390 Lce.-Sergt. E. A. Campbell.

Without Gratuity.

No. 6,433 Sergt.-Major A. F. Tait.
„ 6,686 „ E. W. Newland.
„ 6,446 „ A. MacNab.
„ 6,665 „ F. J. Bollen.
„ 5,229 „ J. R. Ess.
No. 6,789 Sergt.-Major J. McL. Morrison.
„ 6,372 Sergt.-Major J. M. Power.
„ 6,095 „ A. L. Martin.

E. M. WILSON, D.A.D.G.,
Army Medical Service.

Transfers, &c.—4140 2nd Class Staff-Sergt. W. A. West to Ho. Co. Vol. Inf. B.B. Coy., Nov. 14; 9695 Sergt. F. Yeo to No. Wn. Dt. Coy. Militia, Nov. 16; 9162 2nd Class Staff-Sergt. W. Pritchard to Ea. Dt. Coy. Militia, Nov. 16; 5443 Lce.-Sergt. H. Cross to Ho. Dt. Coy. Militia, Nov. 17; 8883 Lce. Sergt. A. Fowler to Scottish Dt. Coy. Militia, Nov. 21; 9144 Sergt. J. F. Meredith to Colonial Govt., Northern Nigeria, Nov. 27.

Transferred to Army Reserve.—14695 Pte. A. Keeber, Nov. 12; 12729 Pte. J. H. Brewer, Nov. 12; 14568 Pte. J. C. Jones, Nov. 17; 14560 Pte. J. Rolfe, Nov. 17; 14656 Pte. J. Dillon, Nov. 17; 14576 Pte. G. Meehan, Nov. 17; 14670 Pte. W. Sturgess, Nov. 17; 14699 Pte. F. Robinson, Nov. 18; 11292 Pte. H. C. Watts, Nov. 17; 14614 Pte. W. Rooke, Nov. 17; 14648 Lce.-Corpl. B. G. Tompsett, Nov. 17; 14650 Pte. A. M. Withers, Nov. 17; 14476 Pte. T. Walsh, Nov. 17; 14561 Pte. F. A. Vowles, Nov. 17; 10062 Pte. J. Lawrence, Nov. 13; 11869 Pte. G. R. Maxted, Nov. 31; 14539 Pte. E. G. Cairns, Nov. 21; 12982 Lce.-Corpl. F. J. Croxford, Nov. 21; 14712 Pte. E. Cockrell, Nov. 22; 14708 Pte. G. Edmunds, Nov. 21; 14715 Pte. F. E. Gillam, Nov. 22; 14556 Pte. T. J. Hall, Nov. 21; 14540 Pte. J. Holland, Nov. 21; 14658 N. H. O'Brien, Nov. 21; 14640 Pte. N. F. Parry, Nov. 21; 14522 Pte. W. J. Russell, Nov. 21; 13174 Pte. J. Stephens, Nov. 21; 11248 Pte. H. Tilley, Nov. 21; 14711 Pte. C. P. Twomey, Nov. 21; 14702 Pte. E. C. Storey, Nov. 28; 14697 Pte. A. Wiles, Nov. 28; 14638 Pte. J. Langan, Nov. 28; 14723 Pte. A. G. Tyler, Nov. 28; 17198 Pte. C. Burton, Nov. 28; 14652 Pte. H. W. Prior, Nov. 28; 14502 Pte. B. Sheppick, Nov. 28; 14667 Pte. T. Ballard, Nov. 28; 14636 Pte. J. Falloon, Nov. 28; 14608 Pte. J. H. Gray, Nov. 28; 14675 Pte. H. J. Bulbrook, Nov. 28; 14575 Pte. W. Colman, Nov. 28; 14524 Pte. J. Lavery, Nov. 28; 14635 Pte. C. W. Cook, Nov. 28; 11349

Pte. M. Cliffe, Nov. 13; 11360 Pte. W. A. Lamb, Dec. 5; 9689 Pte. H. Speight, Dec. 3.

Discharges.—As "medically unfit": 6734 Pte. F. Hartley, Nov. 11; "1st period": 8944 Corpl. D. Henderson, Nov. 17; "2nd period": 5256 Sergt.-Major A. Jamieson, Dec. 1; "2nd period": 5267 Sergt.-Major F. Day, Dec. 7; "purchase": 11911 Pte. E. G. Linden, Dec. 9; "1st period": 9431 Pte. A. J. Watts, Dec. 9.

Death.—12031 Pte. W. G. Naylor, York, Nov. 17.

Embarkations.—To Jamaica, per ss. "Dominion," Nov. 20, 1903: 8608 Corpl. R. Houseago, 10522 Lce.-Corpl. A. Holloman, 11320 Lce.-Corpl. R. Watts, 18501 Pte. J. Cannell, 17749 Pte. J. Coughey, 17215 Pte. W. Lilley, 18274 Pte. W. Mixon, 17362 Pte. H. Shaw. To Barbados, per ss. "Dominion," Nov. 20, 1903: 6263 1st Class Staff-Sergt. J. A. Sykes, 8894 Sergt. J. W. Parsons, 10445 Sergt. E. Haynes, 18439 Pte. W. T. Leach, 1713 Pte. J. Smith, 18588 Pte. R. Moreland. To St. Lucia, per ss. "Dominion," Nov. 20, 1903: 7877 1st Class Staff-Sergt. E. Kirk, 18113 Pte. F. J. Shaw, 18063 Pte. F. Welch. To St. Helena, per ss. "Dominion," Nov. 20, 1903: 17060 Pte. S. Reeves. To Halifax, N.S., per ss. "Dominion," Nov. 20, 1903: 9694 Corpl. H. C. Wicks, 11392 Pte. E. Conner, 12518 Pte. H. Gale. To Bermuda, per ss. "Dominion, Nov. 20, 1903: 15204 2nd Class Staff-Sergt. A. H. Carter, 8994 Sergt. C. Kingston, 8137 Lce.-Sergt. T. French, 10625 Corpl. A. W. Warren, 15712 Pte. J. H. Ball, 18321 Pte. S. Fleming, 18291 Pte. G. Johnson, 17839 Pte. A. Watkins. To N. Nigeria, per ss. "Jebba," Nov. 27, 1903: 9144 Sergt. J. F. Meredith. To Ceylon, per ss. "Dilwara," Dec. 6, 1903: 8202 2nd Class Staff-Sergt. G. J. Lauder, 9131 Sergt. J. Dunn, 11004 Corpl. C. Thurley, 17085 Pte. J. O'Connor, 18003 Pte. F. Batcock, 17923 Pte. J. M. Morrissay, 18111 Pte. J. F. Riggs, 17043 Pte. W. A. Walker. To Hong Kong, per ss. "Dilwara," Dec. 6, 1903: 10861 Corpl. G. Cleave, 18181 Pte. C. B. Cooper, 18125 Pte. G. Spencer, 16503 Pte. A. McKinley, 17508 Pte. H. Holden, 9085 Pte. W. J. Best, 17178 Pte. G. A. Ingmire, 17119 Pte. J. Holbrook. To Singapore, per ss. "Dilwara," Dec. 6, 1903: 7551 2nd Class Staff-Sergt. W. Fraser, 11528 Corpl. J. Bannister, 17614 Pte. W. Forde, 18521 Pte. J. Carlton, 12283 Pte. W. Carter, 12589 Pte. H. Harris, 12527 Pte. J. Ryan. To Wei-hai-Wei, per ss. "Dilwara," Dec. 6, 1903: 9451 Sergt. A. M. Cæsar, 12439 Corpl. W. S. Le Poidevin, 17358 Pte. C. Ennor, 18245 Pte. A. Denham, 18925 Pte. H. Haigh.

Disembarkations.—From South Africa, per "Tintagel Castle," Nov. 14: 8197 2nd Class Staff-Sergt. J. M. Mason; per ss. "German," Nov. 27: 5671 Sergt. W. H. Servey, 8391 Lce.-Sergt. F. T. Foote, 10892 Corp. H. J. Reeve. Nearly fifty men have also disembarked from South Africa since the 11th ult., for transfer to the Army Reserve (*see* under Transfer, &c.). From Malta, per ss. "Dilwara," Nov. 25: 8886 Sergt. E. E. Sparrow, 7343 Corpl. F. Blatchford, 8768 Corpl. T. Crowther, 16252 Pte. C. Kay, 15472 Pte. W. Lethwaite, 12755 Pte. W. Meredith, 17013 Pte. W. Dawson, 16983 Pte. W. Hoggett.

Supplementary list of advancement of Privates, issued with Corps Orders, dated November, 12, 1903:

To be advanced to the 2nd rate of Corps Pay (8d.).

No.	Name.	Date of Casualty.	Remarks.
12,511	Smith, E.	1.8.03	Special as Clerk.
17,759	Black. J.	1.11.03	Special as Pathological Laboratory Attendant.
11,822	Johnson, G. L.	1.8.03	As Orderlies.
12,253	Dowse, J. J.	1.8.03	As Orderlies.
17,303	Auchterlonie, A.	1.11.03	As Orderlies.
18,149	Godfrey, A. H.	11.12.03	As Clerks.
18,338	Richardson, G. F.	11.12.03	As Clerks.
18,662	Hepburn, A.	11.12.03	As Clerks.

To be advanced to the 3rd rate of Corps Pay (6d.).

No.	Name.	Date of Casualty.	Remarks.
15,861	Hindle, J.	1.8.03	As Orderlies.
16,265	Simes, P. T.		
16,452	Davenport, G.		
17,228	Thompson, A. G.		
17,616	Stradling, W. C.		
17,752	Ricketts, E.		
17,769	Evans, J.		
17,910	Green, W.		
18,084	Simpson, H.		
18,098	Ellis, T. G.		
18,103	Walker, A.		
18,109	Bridge, F. R.		
18,425	Atkinson, F. W.		
17,179	McEnnery, T.		
17,514	Laverty, R.		
17,750	Robinson, W.		
18,281	Ramsey, H. P.		
17,746	Reynolds, D. F.		
17,549	Pepper, J. H.		As Cook.
16,435	Brewer, E. V.		As Cook.
16,399	Elliott, R. D.	1.11.03	As Clerk.
17,306	Whitty, P.	1.11.03	As Cook.
17,316	Batterham, E. J.	11.12.03	As Clerk.
17,716	Harris, J.		As Cook.
17,875	Walton, R.		As Clerk.
18,341	Nettle, A.		As Clerk.
17,619	McDonald, J.		As Clerk.

Amendment to Standing Orders R.A.M.C.

Para. 310 Standing Orders R.A.M.C. is hereby cancelled. All copies of this book must be amended accordingly.

War Office, E. M. Wilson, D.A.D.G.,
December 11, 1903. *Army Medical Service.*

NOTES FROM SIERRA LEONE.—Major Pearse writes that Capt. T. Crean is at present at home on two months' leave for urgent private affairs. Lieut. C. G. Thomson, who has completed his tour on the Coast, remains on temporarily until Capt. Crean returns. Lieut. J. W. Seccombe, who arrived to relieve Lieut. C. G. Thomson, has been posted to the Station Hospital, Tower Hill, for duty. Lieut. C. V. B. Stanley, who has been doing duty at the Station Hospital, Mount Aureol, is under orders to proceed to Mabanta in the Protectorate, in relief of Capt. Argles, whose tour of service on the Coast will soon be completed.

Major F. Smith, D.S.O., who has been recently appointed Sanitary Officer to the command, arrived on November 20, as did also Capt. A. C. Fox, who has been posted to the Station Hospital, Tower Hill, for duty.

Lieut. C. G. Thomson proceeds home, on completion of his tour of service, in medical charge of the troops on board the ss. "Biafra," which leaves about November 24. The troops on board will consist chiefly of No. 40 Coy., Royal Garrison Artillery. This Company, which has just completed a year on the Coast, has, during that time, lost 14 N.C.O.'s and men out of a total strength of 108. Of these, 1 man died, and 13 were invalided to England.

2nd Class Staff-Sergt. Barber arrived on October 2, 1903, and has been posted to the Station Hospital, Mount Aureol, for duty, as have also the two men of the R.A.M.C. who are doing duty in this colony.

NOTES FROM KIRKEE.—Our correspondent, Major J. R. Forrest, R.A.M.C., sends us the following: Sir Thomas Gallwey begins a tour in the Bombay Command by arriving at Poona on the 9th inst. He is due to leave Poona on December 11, and we are expecting him to pay us a visit at

Kirkee. Kirkee, as most of your readers know, is the artillery centre for the Bombay Command, there being here four field batteries and an ammunition column. The enormous number of native followers attached to field batteries must ever be a source of anxiety to the sanitarian. There are here about 700 Syces, Lascars, &c., in addition to cooks, washermen, and sweepers; and nearly all are married and have many children. Some time ago plague broke out in the Syces' lines, and all the followers were thereupon moved into camp. Even there a few cases have occurred, owing either to followers leaving camp and sleeping in infected houses, or to infected unauthorised persons sleeping in camp. Two cases of plague have occurred among the artillerymen. A very interesting case of "recurrent fibroid of Paget" was operated on by Capt. Ross, R.A.M.C., in August last. The growth was situated over the right dorsum ilii, was feebly encapsuled, and attached for the most part to the periosteum. An offshoot grew downwards to the great sciatic notch. The man was sent home last month, and a few days before leaving he suddenly developed complete paraplegia, the rectum and bladder being also affected.

Sir James Monteath has succeeded Lord Northbrook as Governor of Bombay, pending the arrival of Lord Lamington, and it will interest your readers to know that Surg.-Major Beevor, C.M.G., Scots' Guards, has been appointed Acting Military Secretary; he combines these duties with those of Surgeon to his Excellency.

NOTES FROM PUNJAB COMMAND FOR OCTOBER, 1903.—*Appointments*:—Col. W. L. Chester has been appointed Principal Medical Officer, Peshawar District; Lieut.-Col. M. W. Kerin has been appointed to command of the Station Hospital, Peshawar, and therefore transferred to that station from Umballa; Lieut.-Col. D. L. Irvine has been appointed to command of the Station Hospital, Mooltan, and therefore transferred to that station from Rawal Pindi; Lieut. Col. R. Kirkpatrick, C.M.G., has been appointed to command of the Station Hospital, Jullunder, and therefore transferred to that station from Peshawar.

POSTINGS.—On arrival in India the undermentioned officers have been posted to stations noted against their respective names:—

Lieut.-Col. F. H. Treherne, Nowshera; Major E. Davis, Jullunder; Major F. McDowell, Peshawar; Capt. E. H. Condon, Umballa; Capt. C. W. Profeit, Umballa; Capt. J. F. Martin, Rawal Pindi; Lieut. A. H. Hayes, Peshawar; Lieut. J. H. M. Conway, Umballa; Lieut. H. G. S. Webb, Peshawar; Lieut. W. D. G. Kelly, Sialkot.

TRANSFERS.—Capt. J. Powell has been transferred from Umballa to Rawal Pindi district; Lieut. T. F. Ritchie has been transferred from Rawal Pindi to Lahore district.

DEPARTURES.—Col. G. D. Bourke left for England on October 24, 1903, to take up appointment of P.M.O., Devonport. Lieut.-Col. C. R. Tyrrell left for Deolali, *en route* for England, tour expired on October 29, 1903; to sail on November 4, 1903. Major J. M. Reid has been transferred to home establishment from October 7, 1903, while on leave in England.

The undermentioned officers left for England, tour expired on the dates noted against their respective names:—

Lieut.-Col. M. W. O'Keefe, October 24, 1903; Major G. B. Russell, October 14, 1903; Capt. L. P. More, October 14, 1903; Capt. W. S. Harrison, October 14, 1903; Capt. L. F. Smith, October 24, 1903; Capt. H. W. Gratton, October 24, 1903.

Capt. J. H. Robinson left for Somaliland on October 5, 1903, for active service.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.—A.M.D.S., December 14, 1903:—

Appointed Matron: Miss A. E. Wilkinson, November 5, 1903, posted to Woolwich.

Appointed Sisters: Miss F. M. Hodgins, October 21, 1903 (prov.); Miss E. H. Hordley, October 21, 1903 (prov.); Miss M. Steenson, November 24, 1903 (prov.).

Appointed Staff Nurses; Miss A. L. Walker, March 30, 1903; Miss M. L. Harris, November 3, 1903 (prov.); Miss S. K. Bills, December 1, 1903 (prov.), posted to Netley; Miss A. E. Fitzgerald, November 14, 1903 (prov.), posted to Netley; Miss B. N. Daker, December 8, 1903 (prov.), posted to the Cambridge Hospital, Aldershot.

The undermentioned ladies have been confirmed in their appointments, their period of provisional service having expired:—

Sisters: Miss E. E. Cheetham, Miss S. Lamming, Miss G. E. Larner, Miss L. M. Lyall, Miss E. C. Stewart, Miss I. G. Willetts.

Staff Nurses: Miss E. M. Bickerdike, Miss M. M. Blakely, Miss M. M. Bond, Miss A. F. Byers, Miss A. Fitzgerald, Miss E. C. Humphreys, Miss M. Kendall, Miss M. Pedlar, Miss E. M. Pettle, Miss M. L. Potter, Miss L. A. Rideout, Miss M. M. Tunley, Miss K. Ward, Miss A. A. Wilson.

The following Sisters have embarked in the ss. "Plassy" for Indian troopship duty: Miss G. A. Magill, Miss E. C. Stewart.

BIRTHS.

THURSTON.—On Dec. 3, at St. Georges, Bermuda, the wife of Major H. C. Thurston, C.M.G., R.A.M.C., of a son.

RIORDAN.—On Dec. 13, at Abbey House, Waterford, the wife of Lieut.-Col. J. Riordan, R.A.M.C. (R.P.), of a son.

MARRIAGE.

MARTIN—THOMAS.—On November 26, at Southampton, by the Rev. C. R. O. Patey, Vicar of Titchfield, Capt. Claude Buist Martin, R.A.M.C., to Mary, daughter of Dr. Thomas, of Harefield.

DEATHS.

MUMBY.—On December 1, 1903, at Spring Garden Lodge, Gosport, Major Langton Philip Mumby, R.A.M.C., in his 43rd year, youngest son of the late Col. Charles Mumby, a J.P. for Hampshire.

Major Mumby was a student of Westminster Hospital and a Westminster Prizeman (£1,000); M.B.Lond., 1884; M.R.C.S.Eng. and L.S.A., 1883; D.P.H.Camb., 1892. After joining the Army he served in British Honduras, Barbados and St. Lucia. An interval of home service followed, and he went to India, passed the higher standard examination in Hindustani, and was appointed to the charge of the Cantonment Hospital at Umballa in the Punjab, where his great skill as an operator will long be remembered, for in all branches of surgery he was an expert and had most brilliant results. He subsequently served in the operations on the north-west frontier of India in 1897 with the Tochi Field Force, an arduous and trying campaign; was mentioned in despatches, *London Gazette*, February 11, 1898.

Owing to failure of health during a second tour of Indian service he had to return to England. Many of his brother officers will regret the early close of his promising career, for he was a man of very exceptional surgical skill and mental calibre.

DAVIS.—Surg.-Major-Gen. James Davis died at Southsea on November 8. He entered the Service on March 10, 1858, and retired April 15, 1895. He served in the New Zealand Wars, 1861 and 1865. Repulse of attack on Camp Nukumaru, and affair of Kakaramea. Medal. He served also in Bombay and Bengal.

WRIGHT.—Hon. Brig.-Surg. Thomas William Wright died on November 10, 1903. He entered the Service on September 24, 1864, and retired with honorary rank of Brig.-Surg., June 11, 1882. He served in the Ashanti War, 1873-4. Medal.

SYLVESTER.—Deputy-Surg.-Gen. John Henry Sylvester died at his residence, 16, Melbury Road, Kensington, on the 29th ult., aged 73. He served in the field with the 14th Light Dragoons in Persia in 1857, and during the Indian mutiny with the same regiment in the Deccan, Malwa, Nerbudda, and Central India Field Forces, and with the 1st Regiment, Beatson's Horse, in Bundelkhand and Rajputana. Again, as Field Surgeon, he was employed in the Euzofzai Field Force, for which his services received the recognition of the Commander-in-Chief in India.

GLASGOW UNIVERSITY CLUB.

Dinner in London.

The half-yearly dinner of the Glasgow University Club, London, was held in the Trocadero Restaurant on Nov. 26. Sir Wm. Taylor, Director-General of the Army Medical Service, presided, and among the company were Col. Hensman, Major Somerville, Sir George Hare Philipson, Sir Charles Ball, Dr. D. C. M'Vail, Sir John Batty-Tuke, M.P., Professor M'Call Anderson, Surg-Gen. H. Skey Muir, Lieut.-Col. Beatson, Surg.-Gen. Keogh, Lieut.-Col. Babtie, V.C., Professor Barr, Mr. J. J. Stevenson, Dr. Charles Creighton, Dr. C. O. Hawthorne, Dr. Guthrie Rankin, Mr. J. M. Dodds, Professor J. M. Thomson, Mr. J. R. M'Braith, Professor Stockman, and Surg.-Gen. Don. Lieut.-Col. Beatson and Major Somerville attended as representatives of the Glasgow Volunteer Companies of the Royal Army Medical Corps.

After the loyal toasts had been honoured, Sir George Hare Philipson gave the toast of "The Imperial Forces." Incidentally he alluded to the Glasgow Companies of the Royal Army Medical Corps. These companies, he said, had been very successful, and the Club had a special interest in them, seeing that the movement of which they were the outcome took its origin in the University and the Companies were officered by Glasgow graduates.

Surg.-Gen. Keogh replied for the Army. The Medical Service of the Army was very much indebted, he said, to Scotland, and to Glasgow University, for some of its very greatest traditions. He had been closely identified with the recent reorganisation of the Royal Army Medical Corps. When they began with the reorganisation they found there were at headquarters of the Army Medical Department three Glasgow graduates, and when they turned round to examine the headquarters staff itself three more Glasgow graduates were discovered. That was a thing of which the Club might be proud.

Lieut.-Col. Beatson responded for the Volunteers.

In Praise of Alma Mater.

The Chairman then proposed the toast of the evening—"The Club." He said that they were all proud that the University had kept up with the times—if, indeed, she had not often been somewhat ahead of them. Within the last few years a new botanical department had been erected at a cost of about £20,000; a new engineering department, costing more than £20,000, had been added; at present new buildings were being erected for natural philosophy and physics, to cost £40,000, and also laboratories for materia medica, physiology, medical jurisprudence, and public health, at a cost of about £60,000. These were to be paid for partly from the the sum of £70,000 collected mainly through the energy of Principal Story, and partly from Mr. Carnegie's generous gift for the better equipment of the Scottish Universities. Nor had the University lost anything of her old power of sending out into the world men to take positions in the front ranks of every profession and calling. It would be easy to rattle off strings and strings of names of celebrated men Glasgow had given to the world, to say nothing of such as John Knox, Adam Smith, James Watt, Thomas Campbell, and many others famous in theology, literature, art and science; but they liked to think of the famous ones of their own time. At the College his contemporaries thought with pride of such names as William Thomson (Lord Kelvin), Allen Thomson, Lister, W. T. Gairdner, and others. Some could look back to those days when these islands were under a threat of invasion, and they rushed to enrol themselves as privates in the Glasgow University Rifle Volunteers, whose first captain was Lord Kelvin. Some also took part in that great review of Volunteers in Edinburgh, and they rejoiced in realising that the first Captain of their Rifle Volunteer Company was now the first man of science of the day. There was not a student of that time alive to-day who did not remember with reverence and affection that gentle and beloved teacher, Professor Allen Thomson, "the smooth-tongued chief from whose persuasive lips sweeter than honey flowed the stream of speech." They could not forget the flowery oratory of Professor Easton in his lectures on the rather dry subject of drugs. All they knew of râles and other chest sounds they owed to the musical talents of that most amiable and most revered of teachers, W. T. Gaird-

ner, and his apt illustration of them by his "kist o'whistles." What did they owe to Lister? Everything they know of surgery. These were a few only of the names that would never die, and that would be thought of by all who had the privilege of studying under them with esteem, reverence and affection, and to those of them who were still spared they wished long life and happiness. And what was the Club here in London? The natural result of a natural law, which was beginning to be universally recognised, that where two or three Scots were gathered together they must stick to each other and consider the common good of the race. This Club, besides openly conferring a favour and benefit upon this metropolis, did good by stealth through its social aims. It had also practical value in that it was able to be of some assistance to men coming up from the University to start in London. He gave "Continued Success to Glasgow University, their Alma Mater, and Perpetual Prosperity to the Glasgow University Club in London."

The other toasts were "The Guests," proposed by Dr. Guthrie Rankin, and acknowledged by Col. Hensman and Surg.-Gen. Don; and "The Chairman," proposed by Mr. A. A. Jack.—From the *Glasgow Herald.*

RULES FOR DIPLOMA IN PUBLIC HEALTH.

THE RESOLUTIONS AND RULES ADOPTED BY THE GENERAL MEDICAL COUNCIL FOR DIPLOMAS IN PUBLIC HEALTH ARE PUBLISHED FOR THE INFORMATION OF THE OFFICERS OF THE CORPS.

I.—The Council, having regard to the terms of Section 18 of the Local Government Act (1888), and of Section 54 of the Local Government (Scotland) Act (1889), and observing that under those sections special privilege is to be accorded to the holders of the diplomas granted under Section 21 of the Medical Act (1886), and therein described as Diplomas in Sanitary Science, Public Health, or State Medicine, thinks it essential to declare, with regard to its own future action under Section 21 of the Medical Act (1886), that it will not consider diplomas to "deserve recognition in the Medical Register" unless they have been granted under such conditions of education and examination as to ensure (in the judgment of the Council) the possession of a distinctively high proficiency, scientific and practical, in all the branches of study which concern the public health; and the Council, in forming its judgment on such conditions of education and examination, will expect the following rules to have been observed:—

Rule 1.—A period of not less than twelve months shall have elapsed between the attainment of a registrable qualification in Medicine, Surgery, and Midwifery, and the admission of the candidate to any examination, or any part thereof, for a Diploma in Sanitary Science, Public Health, or State Medicine.

Rule 2.—Every candidate shall have produced evidence that, after obtaining a registrable qualification, he has during six months received practical instruction in a laboratory or laboratories, British or foreign, approved by the licensing body granting the diploma, in which chemistry, bacteriology, and the pathology of the diseases of animals transmissible to man are taught.

Rule 3.—Every candidate shall have produced evidence that, after obtaining a registrable qualification, he has during six months (of which at least three months shall be distinct and separate from the period of laboratory instruction required under *Rule* 2) been diligently engaged in acquiring a practical knowledge of the duties, routine and special, of Public Health Administration, under the supervision of—

(*a*) In England and Wales, the Medical Officer of Health of a county or of a single sanitary district having a population of not less than 50,000, or a Medical Officer of Health devoting his whole time to public health work; or

(*b*) In Scotland, a Medical Officer of Health of a county or counties, or of one or more sanitary districts having a population of not less than 30,000; or

(*c*) In Ireland, a Medical Superintendent Officer of Health of a district or districts having a population of not less than 30,000; or

(*d*) A Medical Officer of Health who is also a teacher in the department of public health or a recognised medical school; or

(*e*) A Sanitary Staff Officer of the Royal Army Medical Corps having charge of an army corps, district, or command, recognised for this purpose by the General Medical Council.

*** The following districts have been recognised by the Council, viz.:—

Aldershot; Salisbury Plain; Southern and Western Districts; Dublin and Cork Districts; Chatham, Home, and Eastern Districts; North-Eastern and North-Western Districts; Scottish District; Gibraltar and Bombay Command.

Note (1).—The certificate of an Assistant Medical Officer of Health of a county or of a single sanitary district having a population of not less than 50,000 may be accepted as evidence under *Rule* 3, provided the Medical Officer of Health of the county or district in question permits the Assistant Officer to give the necessary instruction and to issue certificates.

Note (2).—Provided that the period of six months may be reduced to a period of three months (which shall be distinct and separate from the period of laboratory instruction required under *Rule* 2) in the case of any candidate who produces evidence that, after obtaining a registrable qualification, he has during three months attended a course or courses of instruction in sanitary law, sanitary engineering, vital statistics, and other subjects bearing on Public Health Administration, given by a teacher or teachers in the department of public health or a recognised medical School.

Rule 4.—Every candidate shall have produced evidence that, after obtaining a registrable qualification, he has attended during three months the practice of a hospital for infectious diseases at which opportunities are afforded for the study of methods of administration.

Note (1).—Methods of administration shall include the methods of dealing with patients at their admission and discharge, as well as in the wards, and the medical superintendence of the hospital enerally.

Note (2).—In the case of a Medical Officer of the Royal Army Medical Corps a certificate from a principal Medical Officer under whom he has served, stating that he has during a period of at least three months been diligently engaged in acquiring a practical knowledge of hospital administration in relation to infectious diseases, may be accepted as evidence under *Rule* 4.

Rule 5.—The examination shall have been conducted by examiners specially qualified; it shall have extended over not less than four days, one of which shall have been devoted to practical work in a laboratory, and one to practical examination in, and reporting on, subjects which fall within the special outdoor duties of a Medical Officer of Health.

*** The *Rules* 2, 3, 4, as to study, shall not apply to

Medical practitioners registered, or entitled to be registered on or before January 1, 1890.

II.—The Council shall, from time to time, appoint an inspector or inspectors of examinations in public health, with special instructions to report to the Council whether the examination of each licensing body does or does not afford evidence, on the part of candidates passing such examination, of a distinctively high proficiency, scientific and practical, in each and all of the branches of study which concern the public health.

THE R.A.M.C. FUND.

The eighth meeting of the Committee was held at 68, Victoria Street, S.W. on Wednesday, November 4, 1903, at 3 p.m. Present:—

Surg.-Gen. Sir John B. C. Reade, K.C.B., K.H.P.
Surg.-Gen. H. Skey Muir, C.B.
Lieut.-Col. E. Fairland.
Lieut.-Col. J. F. Beattie.
Surg.-Gen. A. H. Keogh, C.B.
Surg.-Genl. W. L. Gubbins, M.V.O.
Col. H. E. R. James.
Lieut.-Col. E. M. Wilson, C.B., C.M.G., D.S.O.
Lieut.-Col. R. H. Firth.
Capt. G. St. C. Thom.

(1) In the absence of the Director-General, Sir J. B. C. Reade was voted to the Chair.

(2) The Minutes of the seventh meeting were confirmed.

(3) The Chairman notified that Capt. Thom had been elected to the Committee by the officers of the R.A.M.C. Mess at Aldershot, *vice* Capt. J. F. Martin proceeded on Foreign Service.

(4) The quarterly statements of accounts of the R.A.M.C. Fund, Compassionate Fund, and of the R.A.M.C. Band Fund, to September 30 last, were approved by the Committee, and are appended to these Minutes.

(5) It was noted that the sum of £35 5s. 6d. was paid into the Jameson Portrait Fund, in accordance with Minute 1 of the fifth meeting.

(6) In accordance with Minute 6 of the last meeting, Messrs. Holt and Co. were asked if they could give a better rate of interest on deposits than the Bank rate at present given. Messrs. Holt and Co. replied that they were prepared, if out-station accounts were transferred to them, to allow an interest on deposit accounts at seven days' notice, connected with the R.A.M.C. Fund, at $2\frac{1}{2}$ per cent. per annum, irrespective of the Bank rate. It must be understood that adequate balances are maintained on the separate accounts.

The Committee agreed to the proposal made by the Director-General to gradually absorb the separate accounts into one central account to be called "The General Fund" for banking purposes, subject to an arrangement with Messrs. Holt and Co. as to what sum they will expect as an "adequate balance." The Honorary Secretary was instructed to communicate with Messrs. Holt and Co. on this point before any definite arrangement was made.

It was pointed out that this system of having one General Fund will not interfere with the administration of the money according to the wishes of the subscribers, this being merely a matter of accounts. These accounts will be kept as directed in the proceedings of this Committee, with which they will be published.

(7) Letters from Capt. A. H. Waring were laid before the Committee. These letters pointed out that Capt. Waring has handed over the sum of £10 7s. 8d., subscribed by friends of Capt. E. G. Forrest, R.A.M.C., for the purpose of erecting a brass to his memory. It was stated that a tombstone would be provided by his relatives. Mrs. Forrest suggested a Dublin Church or the R.A.M. College for the brass; but on being written to at the instance of the Director-General, she said she had no objection to Capt. Forrest's name being added to the tablet for the R.A.M.C. officers in the Garrison Church at Aldershot, provided the officers who had subscribed to the memorial had no objection.

The Hon. Secretary was instructed to communicate with Capt. Waring, with a view to obtaining an expression of the wishes of the subscribers on this point.

The following are the names of the officers subscribing to the Memorial: Capt. Hay Campbell, Lieut.-Col. Birrell, Major W. B. Thomson, Capt. F. L. Smith, Capt. J. C. Statham, Capt. A. H. Waring, Capt. A. W. Hooper, Capt. Hewetson, Major R. G. Thompson, R. B. Carson, Esq., Civil Surg., Capt. J. Cowan, Major H. N. Thompson, Major R. J. Windle, Major H. E. Cree, Capt. Tibbits, Capt. E. B. Steel, Capt. G. H. Goddard.

(8) Col. James notified that he had arranged with an artist to reproduce pictures in the V.C. Gallery at Wantage relating to medical officers who had gained the V.C. The reproduction will be in water colour, 15 inches by 10 inches, at a cost of £15 per picture. In making the selection of the artist he had been guided by certain testimonials, which he mentioned to the Committee. His selection met with general approval.

Col. James proposed that the artist should receive pay while working at these pictures; but that before a definite commission is given to him he proposes that the artist submit a finished picture for the approval of the Committee. The sum of £15 was voted as a first instalment for this work.

R.A.M.C. BAND FUND.

Balance Sheet for Third Quarter (July—September), 1903.

1903.	Receipts.	£	s.	d.
July 1	Balance from last quarter	117	3	1
,, 3	Second Grant from R.A.M.C. Fund	45	0	0
,, 15	President, Officers' Mess, Aldershot (June Subscriptions)	6	15	0
Aug. 3	Engagement at Aldershot Flower Show on July 22 (10 per cent. on £7)	0	14	0
,, 5	Subscription (Col. J. L. Notter)	0	5	0
,, 14	President, Officers' Mess, Aldershot (July Subscriptions)	3	15	0
,, 29	Engagement at Farnham (10 per cent. on £6 10s.)	0	13	0
Sept. 15	President, Officers' Mess, Aldershot (August Subscriptions)	3	15	0
July-Sep.	On Account of Travelling Expenses of Band to Netley, London, &c.	42	10	0
Sept. 30	Cash in hand, Stamps	0	4	2
		£220	14	3

1903.	Expenditure.	£	s.	d.
July 2	Cheque-book	0	4	2
,, 3	Transfer of Subscription to Lieut. C. E. Parkes (Subscription already paid)	0	5	0
,, 11	Messrs. Hawkes and Co. (Settlement of last quarter's Account)	27	0	6
,, 27	Transfer of Subscription to Major J. B. Wilson (Subscription already paid)	0	5	0
Aug. 1	Pay of Band (July)	18	14	9
Sept. 1	Pay of Band (August)	19	19	3
,, 28	Messrs. Hawkes and Co. (Tailors)	1	14	0
,, 30	Messrs. Gale and Polden for Programmes	0	10	0
,, 30	Messrs. Boosey and Co. for Music	1	10	0
,, 30	Pay of Band (September)	19	10	5
,, 30	Messrs. Hawkes and Co. (Settlement of Account to date)	14	19	11
July-Sep.	On Account of Travelling Expenses to Netley, London, &c.	31	9	9
	Balance Credit	84	11	6
		£220	14	3

Aldershot,
October 3, 1903.

(*Signed*) H. A. HINGE, *Captain*,
Hon. Sec. R.A.M.C. Band.

GENERAL RELIEF (COMPASSIONATE) FUND.

BALANCE SHEET FOR QUARTER ENDED SEPTEMBER 30, 1903.

1903.	RECEIPTS.	£	s.	d.
July 1.	Balance from last account	133	8	6
" 26.	Ladies' Committee R.A.M.C. South Africa Fund (for General Relief Fund)	109	4	0
		£242	12	6

1903.	EXPENDITURE.				£	s.	d.
July 1 to Sept. 30	Ten small Disbursements (see book for details) (Temporary Relief)				32	15	0
Various .	Lieut.-Col. E. M. Wilson (for Urgent Cases) ..				15	0	0
	Postage				0	2	0
	Cash in hand—						
	Balance at Bank	£94	15	6			
	On deposit	100	0	0			
					194	15	6
					242	12	6

ALDERSHOT.
October 9, 1903.

(*Signed*) H. A. HINGE, *Capt.*,
Hon. Sec. General Relief Fund R.A.M.C.

WIDOWS' AND ORPHANS' (COMPASSIONATE) FUND.

BALANCE SHEET FOR QUARTER ENDED SEPTEMBER 30, 1903.

1903.	RECEIPTS.	£	s.	d.
July 1.	Balance from last account..	922	0	4
		£922	0	4

1903.	EXPENDITURE.				£	s.	d.
July 1 to Sept. 30	Disbursement to ten Widows and one Orphan				40	7	0
	Postage				0	1	9
	Clerk (June, July, August and September) ..				1	0	0
	Cash in hand—						
	Balance at Bank	£80	11	7			
	On deposit	800	0	0			
					880	11	7
					£922	0	4

ALDERSHOT,
October 9, 1903.

(*Signed*) H. A. HINGE, *Capt.*,
Hon. Sec. Widows and Orphans Fund.

(9) With regard to pictures illustrating the gallery of the V.C.'s, other than those at Wantage, a proposal by Col. James that steps may be taken to make coloured copies of appropriate scenes depicted in the illustrated papers was approved.

It was pointed out that by this means a complete series of pictures would be obtained to form a V.C. Gallery, while a record of the exploits might be recorded on a tablet.

(10) The report of the Sub-Committee on the arrangements for the Special R.A.M.C. Dinner of October 21 last, was approved by the Committee, and is appended to these Minutes.

Report of Sub-Committee Meeting, held at Aldershot on October 9, 1903, to audit the accounts of the Band Fund for the information of the Committee of the R.A.M.C. Fund.

(1) The following officers were present:—
Surg.-Gen. W. H. McNamara, C.B., C.M.G.
Lieut.-Col. G. W. Robinson.
Lieut.-Col. E. M. Wilson, C.B., C.M.G., D.S.O.
Major Greig.
Capt. Hinge.

(2) The Minutes of the preceding meeting, held on August 3, 1903, were read and confirmed.

(3) The accounts for the third quarter, ending September 30, were laid before the Sub-Committee and passed.

(4) A Balance Sheet for the quarter ending September 30 is appended.

(5) It is not proposed to ask the Royal Army Medical Corps Fund for any further grant to this Fund this quarter.

Aldershot, (*Signed*) H. A. Hinge, Capt.,
October 10, 1903. *Hon. Sec. R.A.M.C. Band Fund.*

Proceedings of a meeting of the Sub-Committee of the Special Dinner, October 21, held at 68, Victoria Street, S.W., on November 2, 1903. Present: Col. W. L. Gubbins, M.V.O., Lieut.-Col. E. M. Wilson, *Hon. Secretary.*

(1) The Minutes of the preceding meeting, held on October 20, were now confirmed.

(2) The Hon. Secretary reported that the Dinner took place at the Whitehall Rooms, Hôtel Metropolé, as arranged, on October 21, and that there were present twenty guests and fifty-four members; total, seventy-four. Lists attached.

(3) He also submitted the accounts, showing that 154 members had subscribed 10s. each, for entertainment of the guests and necessary expenses, making a total subscription of £77.

(4) The expenses had amounted to £54 19s. 7d., which was approximately what the Committee had estimated, and that there remained a balance credit of £22 0s. 5d.

(5) The Sub-Committee recommended that an honorarium of £1 be given to the clerk who had done most of the correspondence, &c., connected with the dinner. This will reduce the surplus to £21 0s. 5d.

(6) The question of disposing of this surplus balance, amounting to £21 0s. 5d. was discussed, and the Sub-Committee recommended that a balance of 2s. 6d. be returned to each subscriber in accordance with the circular letter of July 1. This, with the cost of postage, postal orders, stationery, &c., would absorb about £21.

FUND FOR MEMORIAL TO THE LATE SURG.-GEN. W. NASH, A.M.S.

REPORT OF THE COMMITTEE.

Members:

Deputy-Surg.-Gen. J. Meane (Chairman); Surg.-Gen. W. B. Stevenson, C.B.; Surg.-Gen. W. L. Gubbins, M.V.O.

(A) Early in 1902 a Committee was nominated by the Director-General to carry out the above object, and held its first meeting on March 7, 1902, when it was decided to await the result of circulars issued to the Corps before making any arrangements as to the Memorial. On July 30, 1902, substantial support having been promised, the Committee met and passed the following resolutions:—

(1) That the Memorial Brass be erected in the Chapel at the Royal Victoria Hospital, Netley, and that Col. W. F. Stevenson be asked to take the arrangements for the execution of this work in hand at once, and be empowered to expend up to £20.

(2) That the legend to be inscribed on the brass be as follows: "To the memory of Surg.-Gen. William Nash, M.D., Army Medical Staff, formerly 72nd Highlanders; born November 20, 1839, died January 19, 1902. He served in the Afghan War, 1878-9, and in the Egyptian Campaign, 1882; and for the last three years of his service as Principal Medical Officer at Netley, where his administration will ever be remembered with affection and esteem.

"This brass is erected by upwards of 150 of his former brother officers and friends as a token of their sincere respect, and appreciation of his high character."

(3) That a portrait of Surg.-Gen. Nash be painted, after consultation with an artist of acknowledged excellence, if the funds in hand be sufficient to provide a really good work of art; and that the Secretary be empowered to make necessary enquiries on this point.

(4) That the decision on the subject of the portrait be left over until the next meeting of the Committee in October next, the subscription list being left open until then, as there are certain promised subscriptions still outstanding.

(B) Satisfactory arrangements having been made for reproducing a likeness from a photograph of Surg.-Gen. Nash, Mr. A. Leicester Burroughs was commissioned to paint a portrait. This was carried out during the winter, and was presented to the Officers' Mess at Netley in May of this year.

Meanwhile a brass executed on the lines noted above was mounted in the Chapel of the Royal Victoria Hospital, Netley.

(C) There being after the discharge of the costs of the above a considerable balance in hand, the Committee decided on June 10, 1903, on the proposal of Deputy-Surg.-Gen. Meane, to erect a monument over Surg.-Gen. Nash's grave at Ramsgate. It was then also resolved to give an honorarium of £2 to the clerks employed in the work of the fund.

Under Deputy-Surg.-Gen. Meane's supervision a monument consisting of a carved marble column and base was erected in the Ramsgate Cemetery, the inscription being similar to that on the Memorial Tablet to Surg.-Gen. Nash at Netley.

(D) The following is a statement of the accounts of the fund:—

	£	s.	d.
Total Subscriptions received	£117	19	6
EXPENDITURE.			
To Artist for Picture and Frame	54	10	0
To Henry Rose and Son, for Brass Tablet, &c.	13	13	0
J. Underwood and Sons for Carving and Erecting Monument at Ramsgate	30	0	5
Ramsgate Burial Board Fees	9	0	0
Travelling, Carriage, &c.	1	2	0
Postage	1	16	7
Honorarium to Clerks	2	0	0
Commission on a Cheque	0	0	3
	£112	2	3
Balance ..	5	17	3
	£117	19	6

This closes the account of this fund, a balance being left of £5 17s. 3d. On behalf of the subscribers the Committee asks the R.A.M.C. Fund to accept this balance and to place it to the credit of its Compassionate Branch, to be applied to the same purposes as the General Relief Fund.

The Committee also desires on behalf of the subscribers to thank Sir C. R. McGrigor and Co. for having kept the accounts of the fund.

(*Signed*) J. Meane, Deputy-Surg.-Gen., *Chairman.*
W. B. Stevenson, Surg.-Gen. A.M.S., *Member.*

Surg.-Gen. W. L. Gubbins, M.V.O., having proceeded to Bombay, was unable to sign this statement, but before leaving authorised the above members of the Committee to proceed as if he were present.

December 4, 1903. B. Skinner, Lieut.-Col., *Hon. Secretary.*

[Approved.]

December 7, 1903. (*Signed*) W. Taylor, Director-Gen. A.M.S.

NOTICE TO SUBSCRIBERS.

OFFICERS are particularly requested to give timely notice of changes of station or changes of address, in order to ensure the posting of the Journal to its correct destination.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, &c. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts and commands at home and abroad. All these communications should be written upon one side of the paper only, and be addressed to the Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 68, Victoria Street, London, S.W.

Letters regarding subscriptions, non-delivery of the Journal, or change of address, should be sent to Major T. McCulloch, R.A.M.C., 68, Victoria Street, London, S.W.

Communications have been received from Cols. Macleod, F. Howard, Lieut.-Cols. Hickson, Forman, Macnun, Draper, Pike, Allpoort; Majors Mould, Clark, Mawhimy, J. B. Wilson, Holt, Pearse, Beveridge, G. D. Hunter; Capts. Erskine, Thomas, Mason, Pollock, Beyts, Carrol, Gunter, Rivers; Lieuts. Welland and Scott.

The following periodicals have been received: *The Medical Record, The Medical News, New York Medical Journal, Gazette Med. de Paris, Il Morgagni, The Medical Review, El Siglo Medico, Der Militärärzt, Deutsche Militäräztliche Zeitschrift, Anales de Sanidad Militar, Revue Med. de la Suisse Romande, La Medicina Militar Española, The Boston Medical and Surgical Journal, Annali di Med. Navale, Giornale del Regio Esercito, Le Caducee, The Hospital, The Ophthalmoscope, The Asylum News, St. Thomas's Hospital Gazette, Bulletin de l'Acad. de Med. de Paris, Arch. Med. Belges, Voyenno Medisinskii, The Indian Medical Gazette, The Australasian Medical Gazette.*

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Original Communications.

THE GERMICIDAL ACTION OF ALKALINE SOLUTIONS.

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IN the course of some work undertaken by one of us (J. R. F.), in order to repeat the researches of Vaughan, Novy, and McClintock, upon the germicidal action of the nucleins,* it was thought desirable to control their results by testing the action of the alkaline solutions employed by them to dissolve the nucleins with which they were working.

Vaughan, Novy, and McClintock prepared "nucleins" from the testes, thyroid gland, blood-serum, and yeast by digesting with pepsin and hydrochloric acid for several days, washing and purifying the undigested residue (the nuclein). This was dissolved in weak alkaline solutions, which were then inoculated with certain micro-organisms, and the germicidal action tested by plating out at stated intervals, and, by the diminishing number of colonies that developed upon the plates, estimating the proportion of organisms that had been destroyed.

* See *Med. News* (New York), 1893, May, p. 536; October, pp. 393, 421; December, p. 701. Also "Ptomaines and Leucomaines," Vaughan and Novy, Ed. 3, 1896.

The alkaline solutions which were used to dissolve the nuclein were as follows:—

I. A 0·12 per cent. solution of potassium hydroxide.

II. A 0·12 per cent. solution of potassium hydroxide, to which was added 0·6 per cent. of sodium chloride.

III.

Potassium hydroxide	1·2 grams.
Sodium chloride	6·0 ,,
Sodium bicarbonate	1·0 gram.
Di-sodium hydrogen phosphate ..	1·0 ,,
Water	1,000 c.c.

Apparently the only control that was made, using the solution *without* the addition of nuclein, was one in which the *S. pyogenes aureus* was submitted to the action of a 0·5 per cent. solution of potassium hydroxide, in which this organism is stated to retain its vitality "for some days."

The following series of experiments illustrates the results obtained by Vaughan, Novy, and McClintock, with their comments thereon (from the "Ptomaines and Leucomaines," Ed. 3, 1896, p. 229):—

Experiment I.

A nuclein tube was inoculated with the bacillus of *Asiatic Cholera*, and plates made from this gave the following results:—

Time	Immediately	5 mins.	15 mins.	30 mins.	1 hr.	1½ hrs.	22 hrs.
No. of Colonies ..	2,100	43	54	71	90	115	1,200

That the alkali in which this nuclein was dissolved did not cause the decrease in the number of germs is shown by the subsequent increase.

Experiment II.

Staphylococcus pyogenes aureus.

Time	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of Colonies ..	4,000	1,720	1,050	810	0

Experiment III.

Anthrax Bacillus without Spores.

Time	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of Colonies ..	100	43	10	1	0

Experiment IV.

Cholera Germ.

Time	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of Colonies ..	470	45	1	0	410

It may be stated that the final increase in the number of cholera germs occurred both in the nuclein solution prepared from the serum of the rabbit, and that prepared from the serum of the dog.

Experiment V.

Staphylococcus pyogenes aureus.

Time	Immediately	1 hr.	5 hrs.	19 hrs.	24 hrs.
No. of Colonies ..	Countless	22,000	12,525	155	0

Experiment VI.

Anthrax Bacillus without Spores.

Time	Immediately	1 hr.	5 hrs.	19 hrs.	24 hrs.
No. of Colonies ..	1,120	165	0	0	0

All of the foregoing experiments were made with the solution of nuclein in sterilised water, containing 0·12 per cent. potassic hydrate and 0·6 per cent. of sodium chloride. The following were made in the other solution mentioned. It may be stated that the culture of the aureus experimented with retained its vitality for days in water containing 0·5 per cent. of potassic hydrate.

Experiment VII.

Staphylococcus pyogenes aureus.

Time	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of Colonies ..	5,000	2,500	1,600	1,200	0

Experiment VIII.

Anthrax Bacillus without Spores.

Time	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of Colonies ..	43	7	0	0	0

Experiment IX.

Cholera Bacillus.

Time	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of Colonies ..	350	105	150	42	0

Experiment X.

Staphylococcus pyogenes aureus.

Time	Immediately	1 hr.	5 hrs.	19 hrs.	24 hrs.
No. of Colonies ..	Countless	25,000	5,525	65	500

Experiment XI.

Anthrax Bacillus without Spores.

Time	Immediately	1 hr.	5 hrs.	19 hrs.	24 hrs.
No. of Colonies ..	430	0	0	0	0

It will be seen from the above that in most cases there is a considerable diminution in the number of organisms when they were exposed to the action of these solutions, though in Experiment I. it is not clear, " because there was a subse-

quent increase," why the nuclein and not the alkali was the effective agent.

It is to be noted that several observers have found that alkalies exert a germicidal action upon a variety of microbes.

Sternberg* found that a 10 per cent. solution of potassium hydroxide was fatal to pus cocci; Jager,† that a 1 per cent. solution killed anthrax; Kitasato,‡ that a 0·18 per cent. solution killed typhoid in four to five hours, a 0·237 per cent. solution killed cholera in the same time. Jager and Kitasato obtained similar results with sodium hydroxide. According to Kitasato, a 2·47 per cent. solution of sodium carbonate is fatal to the typhoid bacillus in four to five hours, and a 3·45 per cent. solution killed cholera in the same time; of potassium carbonate, a 1 per cent. solution killed these microbes in five hours. Boer§ found that anthrax was killed in two hours with a 1 in 450; typhoid with a 1 in 190; and cholera with a 1 in 150, solution of sodium hydroxide.

Ammonia in a solution of 0·3 to 0·5 per cent. was also found to be germicidal to typhoid, cholera, and anthrax by Kitasato and by Boer. Lime was found to be still more active by Liborius,‖ a 0·0074 per cent. solution destroying the typhoid bacillus. Soap solutions are also germicidal, partly certainly on account of their alkalinity (Behring, Di Mattei, Jolles).

It is obvious from the foregoing that the presence of alkalies exerts a very marked influence upon certain micro-organisms, in some cases bringing about rapid death.

The following experiments were therefore performed to test the germicidal action of weak alkaline solutions, and especially of those employed by Vaughan, Novy, and McClintock. Precautions were taken to render the experiments as far as possible comparable; agar was used for plating, so that incubation could be carried out at 37° C.

(The following experiments were made with solutions of salts; no nucleo-proteid used.)

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* "Manual of Bacteriology," 1893, p. 175.

† *Arbeit. aus dem Kaiserl. Gesundheitsamte*, 1889.

‡ *Zeitschr. fur Hygiene*, Bd. III., 1888.

§ *Zeitschr. fur Hygiene*, Bd. IX., 1890, p. 479.

‖ *Zeitschr. fur Hygiene*, Bd. II., p. 15.

Experiment III.

A 1 per cent. Na_2CO_3 solution was inoculated with the micro-organisms and plated out.

Immediately.

S. pyogenes aureus		B. typhosus		B. coli	
Loops	Colonies	Loops	Colonies	Loops	Colonies
2	1,280	2	9	2	160
After 2 hours.					
2	146	2	0	2	2

Experiment IV.

Repetition of Experiment III., except that instead of "loop-fuls," fractions of a c.c. of broth cultures were inoculated into the 1 per cent. Na_2CO_3 tubes.

Immediately.

S. pyogenes aureus		B. typhosus		B. coli	
c.c.	Colonies	c.c.	Colonies	c.c.	Colonies
0·1	640	0·1	7	0·1	640
0·2	1,600	0·2	17	0·2	272
After 22 hours.					
0·1	0	0·1	0	0·1	3
0·2	7	—	—	—	—

Experiments III. and IV. show therefore that 1 per cent. sodium carbonate has a marked germicidal action.

The following series of control experiments was made, using physiological salt solution as the medium :—

Experiment V.

Immediately.

S. pyogenes aureus		B. typhosus		B. coli	
c.c.	Colonies	c.c.	Colonies	c.c.	Colonies
0·1	1,120	0·1	1,600	0·1	Over 2,000
0·2	Over 2,000	0·2	Over 2,000	0·2	Over 2,000
After 22 hours.					
0·1	1,600	0·1	Over 2,000	0·1	Over 2,000
0·2	Over 2,000	0·2	Over 2,000	0·2	Over 2,000

This experiment shows that lapse of time and deprivation of nutriment do not account for the germicidal action exerted by an alkaline solution.

Experiment VI.

With a 0·5 per cent. NaOH solution diluted with 7 volumes of physiological salt solution.

Immediately.				*After 22 hours.*			
S. pyogenes aureus		B. coli		S. pyogenes aureus		B. coli	
c.c.	Colonies	c.c.	Colonies	c.c.	Colonies	c.c.	Colonies
0·1	1,500	0·1	640	0·1	6	0·1	3
0·2	2,000	0·2	Countless	0·2	9	0·2	8

Experiment VII.

Broth emulsions were made by adding twenty-four-hour old broth cultures to sterile broth tubes until the latter were just opalescent. Of this opalescent mixture 0·2 c.c. was added to 0·5 per cent. NaOH + physiological salt solution (as in Experiment VI.), and to physiological salt solution tubes respectively. Two loops and 0·1 c.c. were inoculated into melted agar tubes and plated out immediately. After twenty hours the solutions were again plated out, 0·1, 0·2, and 0·3 c.c. being taken.

In NaOH + NaCl.

Immediately.

S. pyogenes aureus		B. typhosus		B. coli	
Loops	Colonies	Loops	Colonies	Loops	Colonies
2	960	2	5	2	3
0·1 c.c.	160	0·1 c.c.	2	0·1 c.c.	0

After 20 hours.

S. pyogenes aureus		B. typhosus		B. coli	
c.c.	Colonies	c.c.	Colonies	c.c.	Colonies
0·1	10	0·1	0	0·1	0
0·2	8	0·2	1	0·2	4
0·3	10	0·3	3	0·3	5

Series of controls in physiological salt solution:—

Immediately.

S. pyogenes aureus		B. typhosus		B. coli	
Loops	Colonies	Loops	Colonies	Loops	Colonies
2	Countless	2	Countless	2	Countless
0·1 c.c.	1,392	0·1 c.c.	560	0·1 c.c.	338

After 20 *hours.*

S. pyogenes aureus		B. typhosus		B. coli	
c.c.	Colonies	c.c.	Colonies	c.c.	Colonies
0·1	1,376	0·1	1,500	0·1	2,400
0·2	Countless	0·2	Countless	0·2	Countless
0·3	Countless	0·3	Countless	0·3	Countless

From these control experiments it will be seen that not only is there no germicidal action exerted by physiological salt solution, but that an actual increase in the number of organisms takes place. The series of experiments using 0·5 per cent. NaOH diluted with seven volumes of physiological salt solution shows a marked contrast. Contrary to the statement of Vaughan, Novy, and McClintock, the *S. pyogenes aureus* is nearly exterminated by this alkaline solution. This organism is comparatively resistant, and some of the cocci in a culture seem to be more so than their fellows, as has been shown by Abbott.

A hanging drop of NaOH solution (0·5 per cent. with 7 volumes physiological NaCl. solution) inoculated with *B. typhosus* showed cessation of all movement after fifteen minutes; the bacilli did not appear to be altered in form. A similar drop with physiological salt solution showed undiminished (rather increased) movement after fifteen minutes.

In the following experiment, Vaughan and Novy's compound solution (No. III., as detailed at the commencement) was used. Controls were made, using physiological salt solution as the medium.

Experiment VIII.

In Vaughan and Novy's solution No. III. (made with NaOH):—

Immediately.				*After* 24 *hours.*			
S. pyogenes aureus		B. coli		S. pyogenes aureus		B. coli	
Loops	Colonies	Loops	Colonies	c.c.	Colonies	c.c.	Colonies
2	62	2	2*	0·1	1	0·1	8
0·1 c.c.	1,008	0·1 c.c.	2	0·2	3	0·2	14

* In many instances the figures seem to be anomalous. But it must be remembered that it is impossible to make all the experiments simultaneously; often five or ten minutes have elapsed before the second amount has been plated, during which time the germicidal action has been going on, and the number of organisms capable of development thereby greatly reduced.

Controls in physiological salt solution.

Immediately. S. pyogenes aureus		B. coli		*After 24 hours.* S. pyogenes aureus		B. coli	
Loops	Colonies	Loops	Colonies	c.c.	Colonies	c.c.	Colonies
2	1,360	2	1,216	0·1	Countless	0·1	Countless
0·1 c.c.	Countless	0·1 c.c.	Countless	0·2	Countless	0·2	Countless

Experiment VIII. shows the very great contrast between the action of the alkaline and of the physiological salt solution.

In all the preceding experiments the conditions were kept as constant as possible by using the same volume of fluid and adding an equal amount of the same bacterial suspension; but, in order to avoid any possibility of error, owing to the use of different tubes as controls and as solutions tested, the following further experiments were performed :—

Tubes of physiological salt solution (5 c.c.) inoculated from broth cultures, and plated out immediately :—

Experiment IX.

S. pyogenes aureus		B. typhosus		B. coli	
Loops	Colonies	Loops	Colonies	Loops	Colonies
2	464	2	640	2	1,120
0·1 c.c.	Countless	0·1c.c.	Countless	0·1 c.c.	Countless

After making above plates, 5 c.c. of following were added, viz., 1 per cent. NaOH solution, diluted with 7 volumes physiological salt solution, and plates made.

Immediately.

S. pyogenes aureus		B. typhosus		B. coli	
Loop	Colonies	Loops	Colonies	Loops	Colonies
2	6	2	0	2	3
0·1 c.c.	4	0·1 c.c.	12	0·1 c.c.	0

After 24 hours.

S. pyogenes aureus		B. typhosus		B. coli	
c.c.	Colonies	c.c.	Colonies	c.c.	Colonies
0·1	0	0·1	0	0·1	0
0·2	0	0·2	0	0·2	0

This shows that the effect of adding the NaOH solution to a suspension containing a large number of bacteria is to reduce the number of organisms capable of development almost to *nil*, and that the action is so speedy that it has taken effect before it is possible to make the plates (see also note, p. 112).

Caustic soda had been used in the previous experiments. In following experiments caustic *potash* was used.

Experiment X.

Tubes of physiological salt solution were inoculated and plated out; then an equal volume of a solution containing 1 volume of 1 per cent. KOH and 7 volumes 0·6 per cent. NaCl. was added, and the mixture again plated out. (Broth tubes were made just opalescent by the addition of a broth culture, and 0·2 c.c. of this emulsion was added to the NaCl. tubes and 2 loops and 0·1 c.c. taken from the NaCl. tubes for plating out. The same was done with the KOH + NaCl. tubes.)

In 0·6 % NaCl. (controls).

B. typhosus		B. coli		S. pyogenes aureus	
Loops	Colonies	Loops	Colonies	Loops	Colonies
2	1,040	2	1,120	2	1,424
0·1 c.c.	Countless	0·1 c.c.	Countless	0·1 c.c.	Countless

After 24 hours.

B. typhosus		B. coli		S. pyogenes aureus	
c.c.	Colonies	c.c.	Colonies	c.c.	Colonies
0·1	Countless	0·1	Countless	0·1	Countless
0·2	Countless	0·2	Countless	0·2	Countless

In NaCl. + KOH (1 per cent. KOH with 7 volumes physiological solution NaCl.):—

Immediately.

B. typhosus		B. coli		S. pyogenes aureus	
Loops	Colonies	Loops	Colonies	Loops	Colonies
2	0	2	2	2	156
0·1 c.c.	1	0·1 c.c.	5	0·1 c.c.	1,770

These plates were incubated for another twenty-four hours and again counted. No further development had taken place, so that growth was not merely inhibited.

After 24 hours.

B. typhosus		B. coli		S. pyogenes aureus	
c.c.	Colonies	c.c.	Colonies	c.c.	Colonies
0·1	0	0·1	0	0·1	1
0·2	0	0·2	0	0·2	1

Experiment XI.

In Vaughan and Novy's compound solution (using KOH), No. III. :—

Immediately.

B. typhosus		B. coli		S. pyogenes aureus	
c.c	Colonies	c.c.	Colonies	c.c.	Colonies
0·1	1	0·1	75	0·1	Countless
0·2	0	0·2	195	0·2	Countless (more than 2,000)

After 24 hours.

B. typhosus		B. coli		S. pyogenes aureus	
c.c.	Colonies	c.c.	Colonies	c.c.	Colonies
0·1	0	0·1	0	0·1	250
0·2	0	0·2	0	0·2	480

These show the extremely rapid germicidal action of the alkali; before it is possible to plate out, the majority of the organisms have been destroyed. Over 2,000 microbes were present in the quantities plated, as is shown by the following control.

Control, in physiological NaCl. :—

Immediately.

B. typhosus		B. coli		S. pyogenes aureus	
c.c.	Colonies	c.c.	Colonies	c.c.	Colonies
0·1	Countless	0·1	Countless	0·1	Countless
0·2	Countless	0·2	Countless	0·2	Countless

Experiment XII.

Broth tubes made opalescent with a twenty-four-hour broth culture of anthrax, and a twenty-four-hour peptone water culture of cholera. Of the opalescent emulsion of each organism 0·2 c.c. was added to a tube of Novy's compound solution (No. III.), and to a tube of 1 per cent. KOH + 7 vols. physiological salt solution. Of these 0·1 c.c. and 0·2 c.c. were used for plating out.

In KOH (1 per cent.) + 7 volumes physiological NaCl. solution (= 0·12 per cent. KOH), (Vaughan and Novy's solution No. II.):—

Immediately.

Anthrax (without Spores).		Cholera.	
c.c.	Colonies.	c.c.	Colonies.
0·1	3	0·1	0
0·2	5	0·2	0

After 24 *hours.*

Anthrax (without Spores).		Cholera.	
c.c.	Colonies.	c.c.	Colonies.
·1	0	·1	0
·2	0	·2	0

After 72 *hours.*

Anthrax (without Spores).		Cholera.	
c.c.	Colonies.	c.c.	Colonies.
·1	0	·1	1
·2	0	·2	2

In Vaughan and Novy's compound solution (No. III.):—

Immediately.

Anthrax (without Spores).		Cholera.	
c.c.	Colonies.	c.c.	Colonies.
0·1	160	0·1	6
0·2	300	0·2	16

After 24 hours.

Anthrax (without Spores). c.c.	Colonies.	Cholera. c.c.	Colonies.
·1	0	·1	0
·2	0	·2	0

After 72 hours.

Anthrax (without Spores). c.c.	Colonies.	Cholera. c.c.	Colonies.
·1	0	·1	0
·2	5	·2	0

Control: In physiological NaCl. solution:—

Immediately.

Anthrax (without Spores). c.c.	Colonies.	Cholera. c.c.	Colonies.
0·1	Countless	0·2	Countless

Experiment XIII.

In KOH (1 per cent.) + 7 volumes physiological NaCl. solution. (Vaughan and Novy's solution No. II.):—

Immediately.

Anthrax (without Spores). c.c.	Colonies.	Cholera. c.c.	Colonies.
·1	29	·1	0
·2	42	·2	0

After 24 hours.

Anthrax (without Spores). c.c.	Colonies.	Cholera. c.c.	Colonies.
·1	160	·1	0
·2	240	·2	0

In Vaughan and Novy's compound solution No. III. :—

Immediately.

Anthrax (without Spores).		Cholera.	
c.c.	Colonies.	c.c.	Colonies.
0.1	40	0·1	7
0·2	88	0·2	12

After 24 *hours.*

Anthrax (without Spores).		Cholera.	
c.c.	Colonies.	c.c.	Colonies.
·1	47	·1	0
·2	71	·2	0

Again, the germicidal action upon cholera is very rapid, for over 2,000 microbes were present in the quantities plated, as is shown by the following control.

Control in physiological NaCl. solution :—

Immediately.

Anthrax (without Spores).		Cholera.	
c.c.	Colonies.	c.c.	Colonies.
·1	166	0·2	Countless.

After 24 *hours.*

Anthrax (without Spores).		Cholera.	
c.c.	Colonies.	c.c.	Colonies.
0·1	165	0·2	Countless.

Experiment XIV.

Anthrax with spores was used in the following experiments.

In KOH (1 per cent.) + 7 vols. physiological NaCl. solution (= 0·12 per cent. KOH). (Vaughan and Novy's solution No. II.) :—

Immediately.

Anthrax (with Spores).	
c.c.	Colonies
0·1	115
0·2	232

After 24 hours.

Anthrax (with Spores).	
c.c.	Colonies.
0·1	55
0·2	120

In Vaughan and Novy's solution No. III.:—

Immediately.

Anthrax (with Spores).	
c.c.	Colonies.
0·1	125
0·2	285

After 24 hours.

Anthrax (with Spores).	
c.c.	Colonies.
0·1	90
0·2	202

Control in physiological NaCl. solution.:—

Immediately.

Anthrax (with Spores).	
c.c.	Colonies.
0·2	960

After 24 hours.

Anthrax (with Spores).	
c.c.	Colonies.
0·2	98

It is to be noted that it is difficult to prepare a uniform suspension of anthrax, and we would not lay much stress on the results obtained with this organism.

Experiment XV.

As is well known, the blood serum exerts a marked germicidal action *in vitro*, an action which is stated to be due to proteids (alexins), or, according to Vaughan, Novy, and McClintock, to their nuclein constituents. At the same time, it is to be noted that the serum is alkaline to an extent corresponding to about 275 milligrams of NaOH per litre (= 0·275 per cent.). It was, therefore, thought desirable to attempt to imitate the salts of the serum and to test the germicidal action of such a solution. The following solution was prepared.

NaCl.	..	5·3 grams.
$NaHCO_3$	..	3·15 do.
Na_2SO_4	..	0·25 gram.
Na_2HPO_4	..	0·05 do.
KCl.	..	0·35 do.
K_2SO_4	..	0·35 do.
Tap water	..	1,000 c.c.

This mixture approximates roughly to the composition of the salts of the serum as given in various text-books. Its action was tested upon typhoid, coli, cholera, and *Staphylococcus pyogenes aureus* in the same manner as before, but no appreciable germicidal action could be detected.

Experiment XVI.

Ammonia is germicidal in a manner similar to soda and potash. The following solution was prepared: 0·5 c.c. of the strong liquid ammonia was added to 600 c.c. of physiological salt solution, and the germicidal action of the solution was tested in the same manner as before with the following results:—

(*a.*)

		Typhoid	Coli	Aureus	Cholera
5 minutes after mixing ..	1 droplet	15	800	1,000	800
After 4 hours	2 droplets	0	0	Slight diminution	0
After 24 hours	3 droplets	0	0	Ditto.	0

(*b.*)

Immediately	1 droplet	300	600	150	5
	3 droplets	750	1,500	520	7
Average for 1 droplet..		260	532	170	3
After 2 hours	6 droplets	0	1,300	80	0
Average for 1 droplet		0	230	13	0

From this it is apparent that a dilute solution of ammonia exerts a distinctly germicidal action, which is especially marked in the case of typhoid, coli, and cholera. As in previous experiments, the *Micrococcus pyogenes aureus* proved much more resistant.

Conclusions.

The following may be stated as the main conclusions to be deduced from the foregoing work :—

(1) A 1 per cent. solution of sodium carbonate is absolutely germicidal to the *B. typhosus* and *B. coli*, partially so for the *M. pyogenes aureus*.

(2) A 0·06 per cent. solution of caustic soda in physiological salt solution has a similar action.

(3) Vaughan and Novy's solution (No. II.) is absolutely germicidal for *B. typhosus* and *B. coli*, nearly so for the *M. pyogenes aureus*.

(4) Vaughan and Novy's compound solution (No. III.) has a similar action.

(5) Vaughan and Novy's compound solution (No. III.), but substituting caustic soda for caustic potash, has a similar action.

(6) These solutions have an absolute germicidal action upon the *Cholera vibrio*.

(7) Weak ammoniacal solutions are also similarly germicidal.

(8) The results obtained with anthrax are irregular. This is probably on account of the difficulty of preparing a uniform suspension of this organism.

(9) A solution of salts to imitate the salts of the blood-serum was not germicidal.

(10) Vaughan, Novy and McClintock's results with regard to the germicidal action of nucleins cannot be looked upon as reliable; since, from our experiments detailed above, the alkaline solutions used as solvents for the nucleins would alone account for the germicidal action obtained.

II.—CLINICAL URINARY ANALYSIS: A CRITICAL STUDY.

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In the September number of this Journal appeared a paper on this subject in which I described a suggested form of report for quantitative urinary analysis, and also devoted some space to brief notes on the methods employed in its compilation. In this paper will be given some schemas or charts based on actual cases, for the purpose of illustrating the clinical value of a system of careful urinary analysis. The paper will be concluded by remarks on the inferences which may be drawn from variations from the normal in the proportions of urinary constituents, and their import in the prognosis or diagnosis of disease.

To obviate references, the following brief *résumé* of my earlier article is given.

A description was given of an analytical report form for urinary work, which, besides giving the qualitative analytical results and illustrating the microscopical, included two schemata or charts. The first of these charts was intended to show the curve or tracing of the urinary output for the twenty-four hours. The normal for the individual was first found by multiplying the amount of urinary constituents—which an average kilogramme of healthy tissue had been found experimentally to produce—by the number of kilogrammes of body weight of the individual in question. The normal when found was shown by a line drawn at 100, the curve or tracing representing the amounts actually present, being worked out in percentages to the normal. This form of schema is illustrated in figs. 1 to 4. The other schema described was one where the quality alone of the urine was considered, the proportions in which the principal urinary constituents were present being shown by a series of columns. The proportions actually found were illustrated by double columns, while the normal proportions or ratios, which served as a guide, were represented by black columns placed alongside the others. Cases worked out on this system will be found on pages 128 to 130.

The schema just described is the only one employed in cases of acute disease, though it may be filled in also to any required extent in nearly all chronic cases. The column schema being more reliable and accurate than the first or percentage schema, the deductions which may be made from it are more valuable.

As this paper is written with the object of drawing attention to the value of quantitative urinary analysis, I have considered it advisable to give four or five specimens of each kind of schema. It is impossible to attempt to describe or discuss the urinary curve in all pathological conditions without making the paper of undue length. I have therefore deemed it better to select and describe such cases merely as illustrate the value of the system and the object I have in view.

As the first four schemas illustrate the work of three separate observers who have not in all cases used identical analytical methods, some explanation on this point will be necessary.

The "normal per kilogramme" units of Gautrelet, *i.e.*, the amounts of urinary constituents which have been found experimentally to be excreted per kilogramme of healthy body weight, have been used in every case. These amounts are 24 c.c. of water, 1 gramme of extract, 0·5 gramme urea, 0·1 gramme chlorine, 0·05 gramme (P_2O_5), 0·03 gramme acidity if expressed as P_2O_5, otherwise 0·5 c.c. normal alkali solution, 0·001 gramme uric acid, and the same amount of urobilin per kilogramme.

The second factor necessary to find the individual normal has in all cases, except those analysed by myself, been the mean between the actual weight and theoretical weight for height. In the cases which I have analysed the actual body weight alone has been taken into consideration. The allowances made for age and diet are those described in my earlier paper.

I am uncertain as to some of the methods used by Richard (one of the observers), but as there is little or no variation in the methods used by French chemists in urinary analytical work, one may assume that, with two exceptions to be described, the methods used by Gautrelet and Richard are similar to those used by myself and described in the last paper. The exceptions mentioned are in the method used for estimating (1) the extract of total solids, and (2) the urea. In France the extract is generally estimated by evaporation and then drying at 100° C. I have estimated the solids by densimetry, the specific gravity having been previously determined with great care by weighing.

As far as I am aware, neither Richard nor Gautrelet eliminate the preformed ammonia or kreatinin before doing their urea estimations; consequently the results in their cases will be to some degree erroneously higher than those obtained by the process I use. The fact that the processes used have not in all cases been identical seems, in my opinion, to enhance rather than diminish the value of the results, showing as it does that alterations produced by disease on the nutritional rhythm quite overshadow the smaller differences due to different analytical methods.

Gautrelet's analyses are taken from his most recent work ("Spectroscopic Critique des pigment urinaires normaux"), while I am indebted to Dr. Gilchrist, of Nice, for his kindness in allowing me to publish some of his cases analysed by Richard (Analytical Chemist of Nice).

The column schemas illustrated on pages 128 to 130 have been filled in by myself throughout, and the methods used have been those already described by me in my first paper. In two cases the urinary acidity has been determined by the new process of Folin, the organic and mineral acidities being determined separately, and the total acidity estimated by phenol-phthaleine in the presence of oxalate of potassium.

The schemas which have been given illustrate, I venture to think, that a quantitative urinary analysis has its uses. Figs. 5 and 6 are examples of the fact that a qualitative analysis alone is not always sufficient, as a urine may show no abnormality to such tests and yet remain gravely abnormal. The tracings of cirrhosis, gout, tubercle, and dyspepsia show that particular diseases appear to affect the metabolic exchange, each in a special manner. A quantitative analysis may thus be helpful in aiding or confirming a diagnosis. The column schemas of enteric and diabetes are illustrative of the value of a quantitative analysis in the prognosis of disease. The condition of the metabolism is well portrayed in a column schema, and it is evident that the capacity for resisting disease and the chances of recovery depend on good nutrition. In the case of a disease like diabetes a quantitative analysis is absolutely essential; it shows us the exact condition of the patient, whether he is or is not in danger, and the lines on which we should treat the case. To further illustrate the value of quantitative urinary work, I propose to take up in turn each of the urinary constituents generally analysed, and point out the knowledge which

Tracings of Cases of (1) Alcoholic Cirrhosis and (2) Dyspepsia worked out on the percentage schema. The "normal line" at 100 represents the normal urinary output of the individual, the amount actually found being calculated in percentages to that normal. Thus the normal output of A (fig. 1) is not that of B (fig. 1), but the tracings or curves actually found are in relation to their individual normal. For instance, the volume of urine passed by both A and B was about 1,800 c.c., but while this amount was 95 per cent. of the amount A *should* pass, it was only 68 per cent. of the normal amount of B.

More attention should be paid to the *shape* of the tracing than to its relation to the normal line owing to the somewhat arbitrary manner in which the normal must perforce be calculated. Thus in case B (fig. 1) we can see that the urea is less than normal while the uric acid greatly exceeds it, but are more impressed when we realise how greatly the ratio (40 to 1) of the urea to uric acid must be altered in this case (it was actually only 11 to 1).

The amounts actually found in each case have not been given as they take up too much space and would not simplify matters.

TWO CASES OF HYPERTROPHIC ALCOHOLIC CIRRHOSIS.

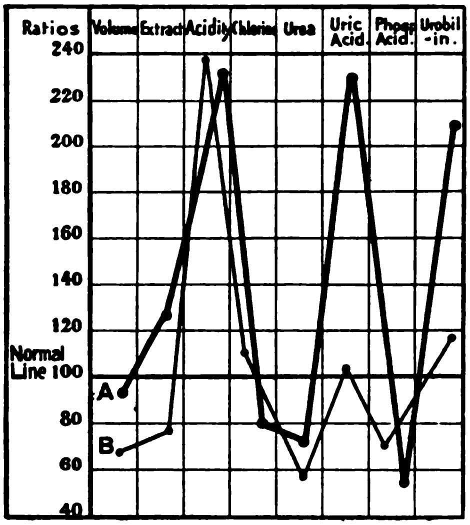


FIG. 1.

A. Case of hypertrophic alcoholic cirrhosis from Dr. Dalton's wards, King's College Hospital. This was a typical case. The liver greatly enlarged and tender; the patient appeared jaundiced (though no bile pigments could be found in the urine). The normal for this patient was somewhat arbitrarily determined as he was not weighed, and so the shape of the curve is more important than its relation to the normal line. Qualitative examination —No albumen or sugar; indican in excess.

B. M. W., a case analysed by Dr. Gautrelet and given in his work "Spectroscopic Critique des pigments urinaire normaux." This was a typical case of alcoholic cirrhosis with an enlarged liver and ascites; traces of albumen, and a marked reaction for indican were found qualitatively.

REMARKS.

The shape of these tracings with their triple "cones" of high acidity, uric acid, and urobilin is typical of that found in most cases of liver diseases, especially alcoholic cirrhosis. Case B, where several analyses always showed this kind of tracing, well illustrates the important part the liver plays in metabolism. The uric acid is high here because of (1) the increased metabolism of hepatic cell nuclei, and (2) the inability of the uroproteic ferment of the liver described by Richet to convert uric acid into urea as happens in health. The urea found is less than normal because of reason (2), and also because owing to the inability of the liver to burn up organic acids absorbed from the gastro-intestinal tract, the ammonia which ordinarily goes to form urea is robbed to neutralise them. The organic urinary acidity was found by Folin's method to be increased in this case, and the ammonia N. reached 10 per cent. of the total nitrogen instead of 3 per cent., its normal amount. The increased amount of urobilin present in both cases is characteristic of similar hepatic conditions. The increase is due (1) to the conditions being more favourable for increased hæmolysis and the reduction of the hæmatin and biliary bilirubin to urobilin; (2) to the fact that the impaired efficiency of the liver prevents it destroying the excess of urobilin taken up from the intestinal tract, where it is largely produced by bacterial action on the bilirubin. The effects of intestinal putrefaction on urobilin excretion are well shown in fig. 6, page 128.

THREE CASES OF DYSPEPSIA.

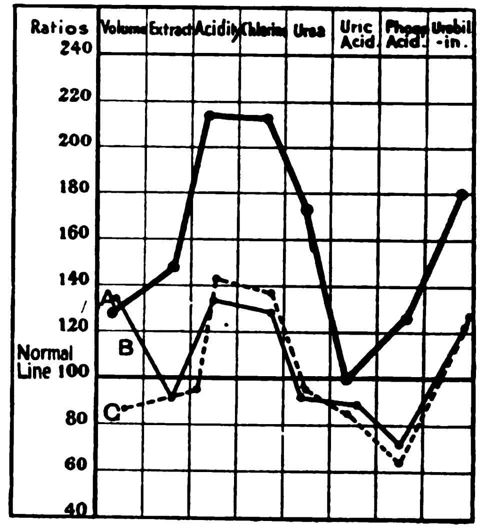


FIG. 2.

A. M. F., a case of dyspepsia with diminished secretion of free HCl. Patient is constipated. Liver very slightly enlarged, no other symptoms. Qualitative examination showed abundant oxalate of lime crystals in the sediment. There were traces of albumoses present and the indican reaction was marked. (Case taken from Dr. Gautrelet's "Spectroscopic Critique," &c.)

B. and C. Two analyses made on the same subject. B by Richard, of Nice, at the instance of Dr. Gilchrist, and C by myself, —an interval of four months separated the two analyses. The case was one of chronic dyspepsia with some diminution of free hydrochloric acid in the gastric juice. The symptoms present were flatulence and constipation, the liver was slightly enlarged and a little tender to deep pressure. The appetite was good and a fair quantity of food taken. The patient was somewhat neurasthenic and suffered from occasional attacks of urticaria. Qualitatively, small quantities of sugar, albumen and albumoses were present, with an abundant sediment of oxalate of lime crystals. The reaction for indican was marked, and the ratio of conjugated sulphates to the total sulphates above the normal— (20 per cent. on the second analysis). The ammonia found on the second analysis (C) was 7 per cent. instead of 3 to 4 per cent., the normal amount.

The organic acidity by Folin's method was greater than the mineral acidity. Total acidity 10, organic 6, and mineral 4, in terms of alkaline solution is 25 c.c. of urine.

REMARKS.

This type of tracing is often seen in chronic dyspepsias associated with increased gastro-intestinal fermentation. The high acidity seen in all these cases is due in all probability to the increased absorption of organic acids from the gastro-intestinal tract, and this is proved by the high organic acidity found ($\frac{6}{10}$ of the total acidity). The urea is either actually or relatively low in all these tracings, the reason in case C being the deviation of the NH_3 from its urea-forming function, to neutralise the acidity. This is probably what has also happened in cases A and B. The high urobilin present is due to the increased intestinal putrefaction and also to the liver insufficiency which so often accompanies dyspepsia.

THREE TRACINGS OF GOUT, TWO REPRESENTING THE TRACING USUALLY SEEN IN THE STATIONARY PERIODS OF THE DISEASE, WHILE THE THIRD, C, SHOWS THAT FOUND TOWARDS THE END OF AN ACUTE ATTACK.

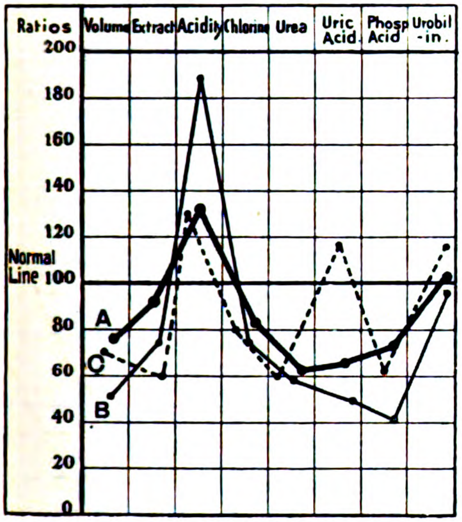


FIG. 3.

A. A tracing of a patient S., a case of hereditary gout. There was a gouty family history of generations. The patient is young (30) and a good liver, inclined to be florid and stout. No symptoms of gout yet appeared. Qualitative examination showed traces of albumen and albumoses. Analysis made by Richard, of Nice, at the instance of Dr. Gilchrist.

B. Analysis made by myself of G. M., a typical case of gout. Patient stout, has tophi in ears, and is subject to occasional attacks of articular gout (great toe joint). The analysis was made in the interval between the attacks. Qualitative examination showed albumen in small quantities and a few granular casts.

C. S. J., a case of acquired gout, the analysis was made at the end of an acute attack of articular gout (great toe joint). Qualitatively, albumen present in traces, bile pigments and a few hyaline casts. Analysis made by Richard at the instance of Dr. Gilchrist, of Nice.

REMARKS.

The tracings A and B illustrate what is generally found in cases of stationary gout or in those who have a gouty tendency, while having no actual symptoms. High urinary acidity and everything else "below the line." Tissue metamorphosis and the metabolic exchange seem to be diminished in gout, there being a tendency rather to put on weight. In tracing C will be found the appearances generally seen in a tracing taken towards the end of an acute attack. There is a "flushing" out of the uric acid which had up till then been defectively eliminated.

TWO TRACINGS OF TUBERCULAR DISEASE, ONE OF THE BLADDER, A, AND ONE OF THE LUNG, B.

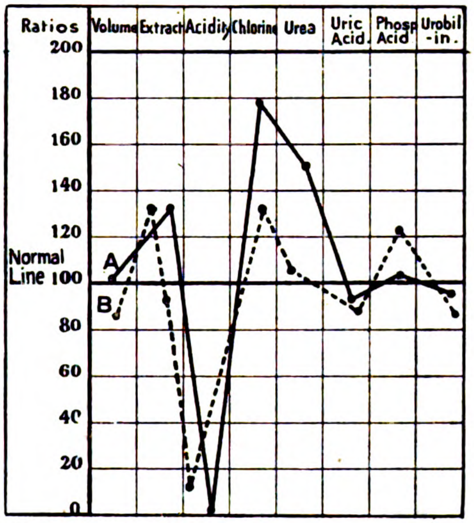


FIG. 4.

A. M. W., a case of early tubercle of the bladder in a lad with a family history of tubercle. There was slight cystitis and some renal pain. The tubercle bacillus was found in the urine, and pus was present in small amount. (A case of Dr. Gautrelet's.)

B. G., a case of phthisis, with a small cavity in the right upper lobe. No marked cachexia present. Evening temperature in axilla generally normal, but rises sometimes to 99 or 100°. The analysis was made by myself before any active treatment had been commenced.

REMARKS.

Although taken from two cases which differed considerably clinically, there is a strong resemblance between these two tracings. This type of tracing is often met with in cases of early tubercular disease, before treatment has modified the tracing. A chart such as this may also sometimes be seen in those free from tubercular disease, but with a strong hereditary tendancy. The condition is shown by an increased output of solids, especially mineral matter, chlorine and the phosphates being present in increased amounts. The acidity is almost invariably low. These facts may be accounted for by the increased tissue metamorphosis present in tubercular disease, especially lung tubercle, and the more intense respiratory exchange. (Robin, Binet.)

GENERAL REMARKS.

The striking contrast between these two sets of cases, the gouty and the tuberculous, is well shown in these schemata. In the case of gout the lower output of solids is evidence of a diminished metabolic exchange, and as a matter of fact, that tissue construction generally exceeds tissue waste is shown by the tendency of gouty patients to put on weight. The increased output of urinary constituents in tuberculous diseases is a symptom of the metabolic activity induced by the disease. An interesting point is that in a healthy man a purely vegetable diet produces a tracing akin to the tubercular chart, while a purely meat diet tracing is very similar to that seen in gouty cases. A tuberculous patient put on the full meat meals accompanying the open-air treatment acquires the hyperacid tracing. That the gouty subject is usually immune to tubercle is becoming generally recognised, and one is inclined to wonder if the success of the Nordrach treatment may be due to the production of a body condition, a *terrain* like that of gout, which is unfavourable to the well-being of the bacillus.

A series of cases worked out on the schema of columns. This schema, which shows the quality of the urine, may be suitably employed in cases of acute disease. In healthy people on ordinary diet there is a ratio of relation between the various normal urinary constituents. In pathological conditions these ratios depart, sometimes widely, from the normal. This schema has been designed to contrast the actual with the ideal. The black columns represent the normal ratios—the dots representing the limits within which the ratio may vary and yet remain normal. The double columns denote the ratios actually found in the case.

A CASE OF CHRONIC DYSPEPSIA. ANALYSIS MADE THE DAY PRECEDING AN ATTACK OF URTICARIA.

CASE OF HYPERTROPHIC ALCOHOLIC CIRRHOSIS.

THE NORMAL RATIOS ARE ILLUSTRATED BY THE BLACK COLUMNS. THE DOTTED TERMINATIONS SHOW THE LIMITS WITHIN WHICH THE RATIOS MAY VARY AND YET REMAIN NORMAL. THE DOUBLE COLUMNS REPRESENT THE RATIOS ACTUALLY FOUND.

Amounts are given in grams.

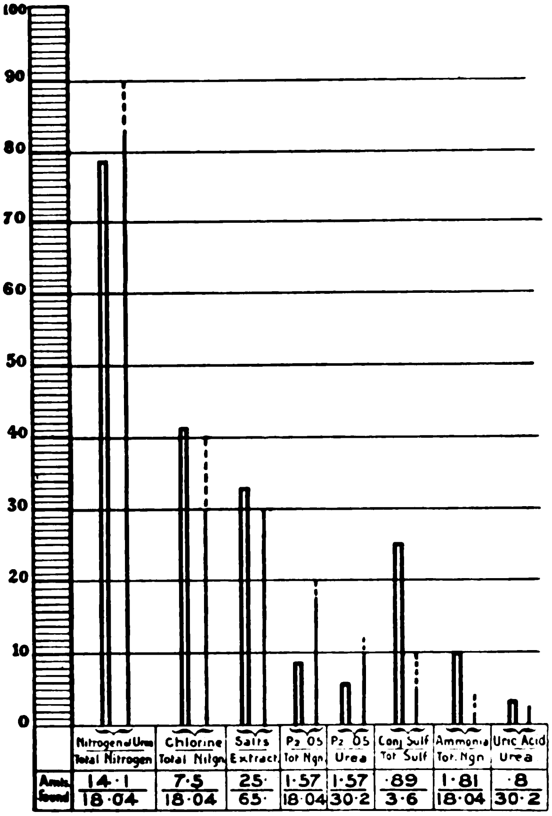


FIG. 5.

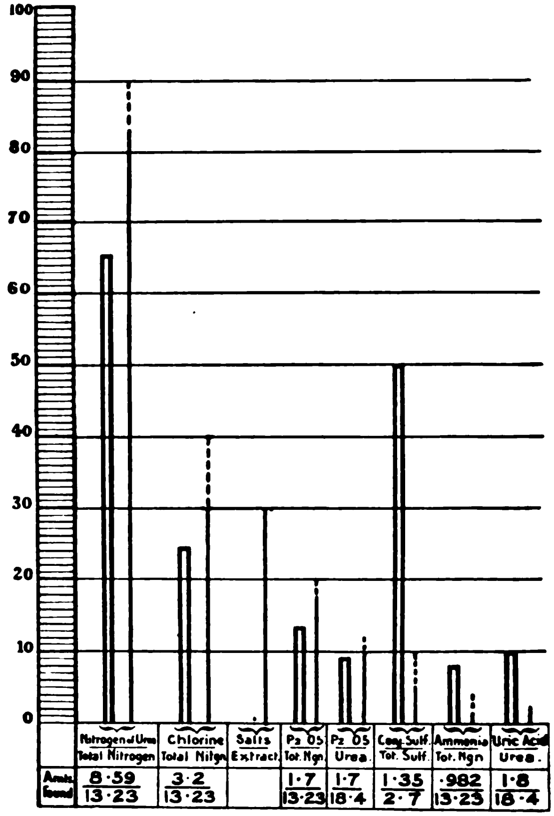


FIG. 6.

J. A case of chronic dyspepsia. The symptoms were flatulence and frequent attacks of constipation. Patient anæmic, suffers from occasional attacks of urticaria. This analysis was made the day before an attack of urticaria, which yielded to a smart saline purge followed by a short course of alkaline table waters. Qualitatively, nothing abnormal was found. The acidity was high, 45 c.c. N. alkaline solution per litre. The organic acidity was $\frac{1}{6}$ of the total acidity. (Folin's method.)

This is the same case as that shown on fig. 1 (tracing A) a typical case of hypertrophic alcoholic cirrhosis, the liver enlarged and tender, some ascites. Patient jaundiced-looking, but no bile pigments found. The analysis represented here was made on a different day to that shown in fig. 1 and is given to show to what extreme limits the ratio $\frac{\text{conjugated sulph.}}{\text{total sulphates}}$ may rise. I am informed by Dr. Lee, Dr. Dalton's house physician, that there was no leucocytosis in this case.

REMARKS.

Both these schemas well illustrate the point to which I drew attention in my first paper, viz., that the urine might still be abnormal when the qualitative tests for albumen and sugar had been negative. Here are two cases which would be described in a case book as "normal," and it is left to a careful quantitative examination to show how abnormal they are, and how gravely affected the metabolism is in each case.

The case of dyspepsia is interesting; an auto-intoxication has probably been going on here by absorption of organic acids and an excess of the aromatic bodies from the gastro-intestinal tract. The high ammonia percentage and the high ratio of the conjugated sulphates shows the strain that has been thrown on the liver in its efforts to neutralise the acids and detoxicate the aromatic bodies. The liver evidently temporarily failed and an urticarial attack is the result of the auto-intoxication. As soon as a purge and alkalies had been given the urticaria disappeared. The disappearance of the urticaria is probably due to the flushing out of the seat of toxic production and a temporary reduction of the intestinal flora, and consequently diminution of the putrefactive processes engendered by them. The alkaline treatment, which is often found to be almost a specific in such cases, possibly acts by increasing the blood alkalinity which has been lowered, or by reinforcing the body bases which have been attacked to neutralise over acid production.

The case of cirrhosis illustrates the increase in the ammonia ratio which I have referred to when speaking of the same case on page 126. It will be remarked, how the increase in the amount of the nitrogen of the ammonia diverted to neutralise the acid excess, and the increased amount of uric acid, has affected the columns $\frac{\text{nitrogen of urea}}{\text{total nitrogen}}$, which is 66 per cent. instead of from 83 to 90 per cent. The conjugated sulphate in this case was remarkably increased on the day this analysis was made, and it is interesting to note that the urobilin which was always high in this case increased to eight and ten times its normal amount when increased intestinal putrefaction (instanced by the high ratio of conjugated sulphates) was present, being lowered to only twice or three times the normal when the conjugated ratio fell. It would appear that the highest function of the liver is to destroy (probably by oxidation) toxic products of all nature invading it from the gastro-intestinal tract. If owing to any cause this property becomes impaired it can still save the organism by neutralising and detoxicating these bodies by synthetic processes. This is evidenced by the power possessed by healthy livers of destroying urobilin excess—burning up organic acids and conjugating and neutralising that which they cannot destroy. A point to be noted in connection with this case of cirrhosis, is, that although the uric acid output was high there was no leucocytosis—the increase in the number of white blood cells is considered to be the cause of the increased uric acid output in leucocythemia.

TWO ANALYSES OF THE URINE IN A CASE OF ENTERIC FEVER.

THE NORMAL RATIOS ARE ILLUSTRATED BY THE BLACK COLUMNS. THE DOTTED TERMINATION SHOW THE LIMITS WITHIN WHICH THE RATIOS MAY VARY AND YET REMAIN NORMAL. THE DOUBLE COLUMNS REPRESENT THE RATIOS ACTUALLY FOUND.

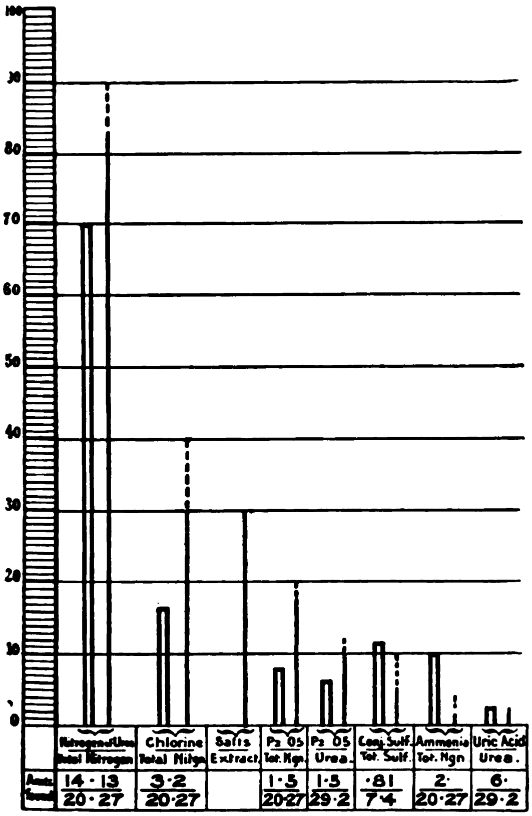


Fig. 7.

Quantity ·74 litre.
Albumen present, traces.
Albumose present, traces.
Sugar—very slight traces.

Indican in excess.
Urobilin—excess.

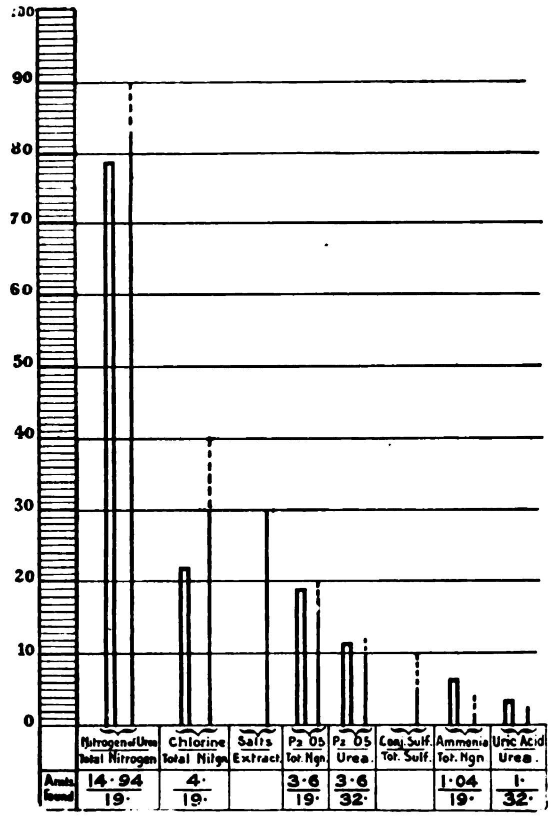


Fig. 8.

Quantity 1 litre. Albumen—faint traces. No Albumoses or Sugar. Indican not in excess.

M. A case of typical enteric fever from Dr. Dalton's wards in King's College Hospital. The first analysis was made at the end of the second week and the second at the end of the third. The case was not a severe one, the temperature fell to normal on the 17th day, the second analysis being made three or four days after it had become normal. The points to be noted are (1) the general improvement shown in the metabolism; (2) the rise in the ratio $\frac{\text{nitrogen of urea}}{\text{total nitrogen}}$ this ratio is a very important one in cases of fever, and especially enteric and other fevers of long duration. The column falls as a rule in proportion to the severity of the disease, and rises with convalescence. In certain cases of typhoid when there is rapid intoxication this fall is not always as marked as one would expect it to be, but in the ordinary run of cases this ratio varies directly with the severity of the case. In fact, Robin considered this ratio so important in cases of enteric that he divided his cases into severe and benign according to the height of this column. It will be seen that the ratio has risen from 69 per cent. to 79 per cent. in eight days. In this case, with the rise in the $\frac{\text{urea N.}}{\text{total N.}}$ column, there has taken place a fall in the ammonia column to normal limit. The rise in the columns for P_2O_5 and the chlorine column are indicative of the improved metabolism, there being no longer present the necessity for the blood to tenaciously guard its salts as occurs when the body is defending itself against serious disease.

CHART OF TWO CASES OF DIABETES.

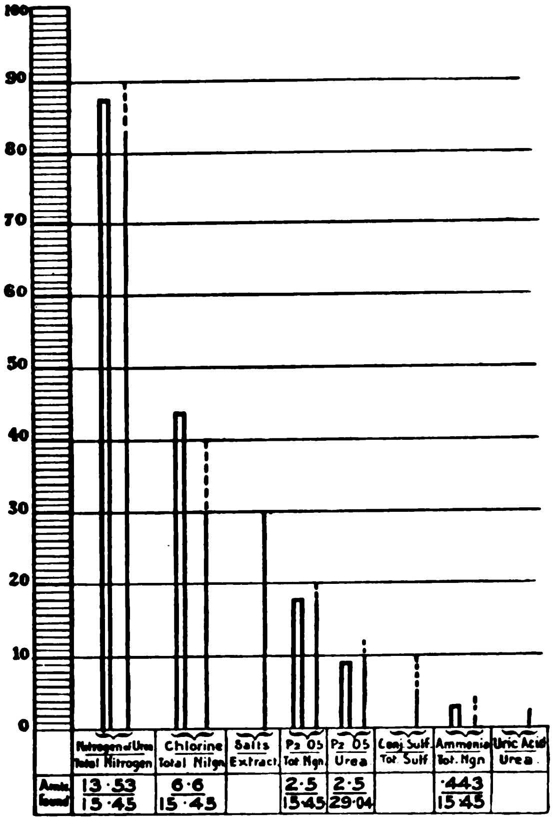


FIG. 9. CASE A.

5¼ litres of urine passed in the 24 hours. Acetone and diacetic acid present. B. oxybutyric acid 270 gr. in the twenty-four hours. Sugar 8·6 per cent.

G. S. A case of diabetes in a man, aged 40; the disease has been present four or five years. During the last year the amounts of sugar and oxybutyric acid passed has been always considerable. The ammonia has risen to 20 odd per cent. of the total nitrogen when no alkalies have been taken, and the ammonia excreted has varied directly with the amount of oxybutyric acid in the absence of special alkaline treatment.

The patient is now on ordinary mixed hospital diet and is receiving 2 oz. of sodium carbonate a day by way of treatment.

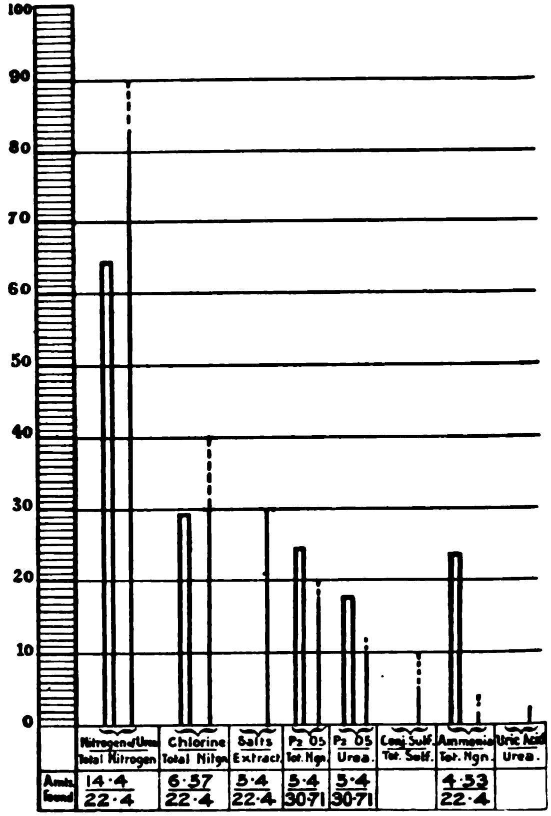


FIG. 10. CASE B.

5 litres of urine passed in twenty-four hours. Acetone and diacetic acid present. B. oxybutyric acid 179 gr.

B. S. A case of diabetes in a young man, aged 21, who has had diabetes for two years, and three times been on the verge of coma, being relieved each time by the administration of large amounts of alkali. The blood alkalinity has been constantly subnormal, never above $\frac{N}{80}$ for some time past.

The patient is at present on a liberal diabetic diet and is receiving ℥i. of citrat. of sodi. and xxx. gr. of bicarbonate every three hours.

REMARKS.

These two cases are interesting from several points of view. It will be noticed that while the output of B. oxybutyric acid in Case 9 is greater than that of Case 10, the ammonia is much less, in fact, less than normal. This is entirely due to the enormous quantities of sodium carbonate being given. The alkaline base thus supplied is more than sufficient to neutralise the oxybutyric acid, and the result has been that the body bases (especially NH_3) have been spared. This man when not receiving these large amounts of soda excreted large quantities of ammonia, equal sometimes to 20 per cent. and more of his total nitrogen, and, further, the ammonia output varied directly with that of the B. oxybutyric acid.

In Case B, although smaller amounts of B. oxybutyric acid are being passed than in A, the ammonia rises to 24 per cent. of the total nitrogen. Alkalies are, indeed, being given here also, but in less amount than in Case A. (The sodium value of citrat. and bicarbonate of soda being given the patient: equal approximately ½ oz. soda carb. daily—*i.e.* a quarter of the amount being taken by Case A.)

Since the analysis shown on Chart 10 was made the sodium salts being given to the case have been increased by about one-third to a half; the result has been that while the B. oxybutyric acid has been considerably *increased*, the ammonia percentage of the total nitrogen has fallen to 15 per cent. It often happens that the administration of alkaline bases increases the output of the B. oxybutyric; this is due rather to a sweeping out of the sodium oxybutyrate thus formed than to any increased formation of the acid.

By watching the amount of B. oxybutyric acid excreted and noting the ammonia ratio, one is enabled to see clearly the true condition of the patient and avert any impending coma—which it would be otherwise difficult to do. The value of the alkaline treatment was amply demonstrated in both cases

may be gained for diagnosis and prognosis by variations in the amount of their output or ratio. Though objection may be taken to such a method of treating the subject as more suitable for a book than an article such as this, I have adopted it on account of its simplicity and conciseness.

Volume.—Although so easily done, it is not often that one sees the urinary volume carefully measured, and variation in its amount laid stress on; yet much information may be derived from a study of the quantity of urine passed. I do not, of course, refer to variations in the urinary volume of a temporary nature and due to well-known causes, such as climatic influence, or the amount of fluid taken, but to that persistent deviation from the normal seen in some pathological conditions. I will not dwell on the polyurias of diabetes and the small red kidney, or to the increased volume which heralds early kidney irritation, whether due to cancer or tubercle. These conditions are as well recognised as the oligury accompanying acute diseases generally, and especially acute kidney disease and the specific fevers, and require no comment. I would, however, like to call attention to a few conditions not so well known or understood. One of these is the polyuria often seen in the earliest stages of tubercle and sometimes accompanied by an increased output of mineral matter. This polyuria and demineralisation which Robin has fully described in his "Etudes cliniques sur la nutrition dans la phthisie pulmonaire," he ascribes to the vital reaction of the organism to the tubercular attack. Whatever the reason may be, quantitative analysis might be of use in such cases of early disease and would perhaps help the diagnosis in obscure cases. It has been stated by Gerard that, while the diurnal urinary output of the healthy is in excess of the nocturnal, the reverse of this holds good in disease. The amount of the urinary volume is of the greatest importance in cases of acute and grave disease. Here, owing to loss of water through other channels (sweat, diarrhœa, &c.) or a diminished intake, there is a severe drain on the body water which is so necessary to nutritive exchange and perfect metabolism. The condition so produced Herter considers may partially account for the torpor seen in severe diseases such as enteric fever, the immediate cause being the anhydrous condition of the central nervous system. When one is analysing the urine of diseases such as enteric and notices the highly concentrated fluid full of imper-

fectly elaborated end products, many of which are abnormal and toxic, one feels that cases such as these would do better if the body were more thoroughly flushed out, diuresis encouraged by the ingestion of much larger quantities of water than is usually given to acute cases, and a natural diuretic like common salt given more freely.

In acute kidney disease the volume as well as the solids passed in the urine is of course one of the most important points in the prognosis of the case. This is a well-known fact, but it does not always receive the attention it deserves.

Finally, a knowledge of the urinary volume in acute kidney disease, or in such cases as mitral heart affections, may help us to take early to diuretic measures and so avert an impending uræmia, or improve the condition of a water-logged body.

The Extract.—The amount of the urinary solids can be very rapidly estimated with sufficient accuracy for clinical purposes by a Westphaal balance, and densimetry, and they are worth estimating, as useful information may be acquired from a knowledge of their amount. In acute disease any great increase may indicate the severity of the condition, being a measure of the katabolic intensity. If exudations are to be removed, a knowledge of the amount of solids passed will show us what Nature herself is doing to solve the problem, while a deficiency of solids may point to defective elimination, especially when there is fever present and increased ketabolism (Purdy). Of course the amount of solids present must be calculated from the urine of the twenty-four hours. Individual samples vary markedly in their density. The ratio $\frac{\text{salts}}{\text{extract}}$, which is given in the column schemas, is a useful guide in some conditions, such as the early tuberculous condition already mentioned.

The Urinary Acidity.—Round the question of the acidity of the urine a great deal of argument and speculation has centred, and yet the problem seems no nearer solution. That the urine is acid—that is, the cyclical urine, for the urine passed after a meal of vegetables or fruit may be alkaline—is evident. It is no less evident that in certain pathological conditions, such as the gout, cirrhosis, and dyspepsia schemas illustrate here, and in many others, the acidity is greatly increased as it may be greatly diminished in other pathological states.

The urinary acidity has been considered so important by some,

that diseases have been grouped under two main divisions—diseases of the hyper-acid diathesis and those of the hypo-acid; the divisions being dependent on the reaction of the urine (Gautrelet, Bouchard, Joulie, and others). While one cannot subscribe to statements so sweeping as these, the fact remains that in certain conditions, such as gout, acute rheumatism, diabetes, cirrhosis and others, the urinary acidity is generally markedly and constantly increased, while the opposite holds good as a rule in tuberculous and scrofular affections.

The estimation of urinary acidity is thus an important matter, but is unfortunately beset with many difficulties. The urine is a mixture of bases and acids, the acid ions predominating in normal urine. This mixture gives very different results, according to the indicator used. Phenol-phthaleine gives higher results than litmus, while litmus gives an amphoteric end reaction and phenol-phthaleine an uncertain one owing to the presence of ammonium salts. The difficulties may, however, be surmounted if any one method be used for all cases; such as if neutral litmus paper be always used, or Folin's method with phenol-phthaleine (using an oxalate to destroy vitiating influence of the ammonium salts). The neutral litmus method has been used in all the percentage graphics, while the more recent method of Folin has been used by me in all later work, and is the one employed in the column schemas shown here.

In such a mixture of acids and bases as the urine contains it is difficult to assign the urinary acidity to any one particular acid salt. Up till quite recently, however, it was generally accepted that the acidity was almost entirely due to the acid phosphate of soda. Folin, however, in a recent contribution to the *American Journal of Physiology*, appears to prove that organic acids play a much more important *rôle* in determining urinary acidity than has hitherto been ascribed to them. He shows, in fact, that the acidity of many pathological urines is chiefly due to organic acids. In the schemata illustrating the cases of cirrhosis and urticaria it will be seen that the organic acidity worked out on Folin's method is greater than the mineral acidity. This is also often true of the acidity of diabetic urine. The amount of ammonia present in these cases is to some extent an index of the organic acidity as it is the base used by organic acids.

The amount of urinary acidity is of value as showing the amount

of acid being produced in the body and thrown into the blood. The reaction of the blood in health, as is well known, is of constant and unvarying alkalinity (N/35 Wright's method). This state of blood alkalinity is so vital to our health that the condition is maintained at all costs. The renal epithelium is one of the agents at work to maintain constancy in blood alkalinity. The process is probably a vital and selective one, the excess of acid ions being got rid of as quickly as they appear. Thus in health an increased urinary acidity would not mean a diminished blood alkalinity, but would indicate that a disproportionate amount of acid ions were being produced—thrown into the blood and instantly thrown out again. In certain pathological conditions. however, the blood alkalinity is diminished, often markedly. Perhaps in these cases the vital activity of the renal epithelium is impaired, or is unable to deal efficiently with the greatly increased acid production.

The acidity of the urine can never be considered so important as the blood reaction, as it does not always reflect the condition of the blood probably even in some pathological conditions. As, however, urinary acidity is so readily estimated, and is evidence of body acid production, its amount should always be noted.

The total acidity of the urine, as shown by neutral litmus, works out to about 0·5 c.c. normal alkali per kilogramme of body weight. The increase and decrease of acidity are well shown by the percentage schemas.

One or two points in connection with urinary acidity may be mentioned. Nitrogenous diet quickly increases it owing to the liberation of sulphuric and phosphoric acids. Cheese has the same effect owing to its poverty in alkaline bases and richness in casein (a nucleo-albumen and precursor of uric acid). For the above reasons cheese should be forbidden the gouty, and the nitrogenous part of their diet reduced.

In connection with gout a tradition which will die hard is the supposed efficacy of the salts of lithia in gout. The reason given being that the urate of lithia is the most soluble of all urate combinations. The utter worthlessness of the treatment is well pointed out by Bunge, and will be realised when it is remembered that by Berthellet's law acids distribute themselves to the bases present directly in proportion to the amounts of these bases. The amount of lithia absorbed being but a few grains, the amount of uric acid apportioned to it would be infinitesimal.

As the acid phosphate of soda plays so important a *rôle* in urinary acidity, it was only to be expected that it would be an efficient acidifier of the urine. This has been demonstrated by Robert Hutchison in a recent contribution to the *British Medical Journal*. If given in doses of from 30 to 40 grains it will be found a useful drug in conjunction with urotropin when it is desired to keep the bladder acid and aseptic after operations, or in order to inhibit bacterial action.

The Chlorides.—In both the percentage and column schemas a place is found for the urinary chlorine. It might be thought that a product like chlorine, the excretion of which is so easily influenced by the food taken, could have no clinical significance. This is not so; for while variation in the chlorine excretion in health has little significance, this does not hold good in acute disease. The blood, which so carefully guards its alkalinity, guards its molecular concentration with equal care. If from any cause this concentration has been altered or threatened by losses of salts (chiefly chlorides), the blood retains its salts until the molecular concentration is restored. Common causes of salt retention are the pulmonary and pleuritic exudations seen in pneumonia and acute pleurisy, and chlorine is retained after all hæmorrhages, whether accidental or produced by operation. A low chlorine output may, however, be seen in cases of severe disease, the cause of which cannot always be traced to an increased loss due to any of the causes just mentioned, or to a diminished intake. In such cases a marked fall in the chlorine output is a grave sign, for it tells us that the blood is actively defending its molecular richness. No particular reference of prognostic value can be drawn from an increase of the body chlorides, but generally it holds good that, apart from the influence of food, such an increase coincides with improvement and convalescence. A point of practical interest is the diuretic action of salt. It appears (as Bunge says) as if the products of metabolism cannot be eliminated in aqueous solutions alone, but require a saline solution for the purpose. For this reason salt is most useful in uræmia, as it stimulates renal excretion, especially when injected *per rectum* or infused. Both on account of its diuretic action and its value to the blood, it would, I think, be advantageous to increase the amount of salt given in acute disease. If salt were given, it would help to maintain blood concentration, and

at the same time, by promoting diuresis, flush out the imperfectly elaborated products caused by the impaired metabolism associated with acute disease.

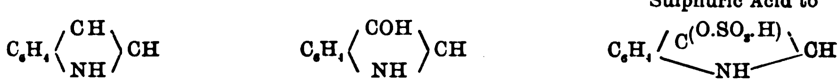
A point of interest, but not of much clinical value, is the effect of vegetable foods on the excretion of chlorine. The potassium, which is so plentiful in vegetable foods, takes up the blood chlorides with avidity when it is absorbed, and as the blood does not tolerate the presence in excess of any one salt, the potassium chloride is eliminated, thus increasing the chlorine output. Vegetable feeders require plenty of salt to compensate for the chlorine loss caused by the high potassium tenure of their food, and it is for this reason that salt is so essential to the rice-eaters of Japan and Bengal, while his language has no name for salt with the meat-eating Esquimaux. Although generally speaking a chloride excess means little, there are two conditions in which one often sees a persistent excess in the chlorine output. These conditions are tubercular disease and certain dyspepsias (see charts 2 and 4). It is difficult to assign any reason for the increase in the cases of dyspepsia which are generally of the type known as acid, with diminished hydrochloric acid and excessive fermentation—unless it is the diminished elimination of chlorine by the gastric membrane, or the abnormal appetite occasionally present. The chlorine increase so often associated with tubercular disease, Robin assigns—as I have already stated—to the demineralisation of the tissues which appear to herald the tubercular attack.

The Phosphates.—What has been said of chlorine retention might equally be applied to the retention of phosphates in acute disease. In such cases the ratio column $\frac{P_2O_5}{\text{Total N}}$ is invariably low, the reason being, as with chlorine, the necessity of up-keep of blood concentration. In acute kidney disease the phosphate excretion is strikingly low. Purdy considers phosphate diminution to be almost as infallible a sign of such conditions as the presence of albumen. An increase of the phosphate ratio is seen in true phosphaturia—which is, however, not a common affection, most of the so-called phosphaturias being nothing more than a deposit of earthy phosphates due to the abnormal alkalinity of the urine. In nervous disorders, and especially during nerve crises, the phosphate ratio is often increased. Phillips and Schaffer, working on a case of alternating insanity, have shown how markedly the phosphates may rise on the " mad " days.

The Sulphates and ratio $\frac{\text{Conjugated Sulphates}}{\text{Total Sulphates}}$.—As the sulphate output in the urine is derived almost entirely from body metabolism and the total sulphates vary directly with the output of nitrogen, no inference of clinical value can be drawn from a knowledge of their amount. Variations in the ratio $\frac{\text{Conjugated Sulphates}}{\text{Total Sulphates}}$ are, however, as important as they are interesting to study. In health nine-tenths or more of the sulphuric acid is eliminated in combination with alkaline bases such as sodium and potassium, the remainder is found combined with certain aromatic radicles. The aromatic bodies found in conjunction with this portion of the sulphuric acid are indol, skatol, kresol, and phenol. These hydroxyl substitution products of benzene, as Hopkins describes them, appear to be derived from the by-products of trypic digestion. While phenol $C_6H_5OSO_3OH$, and kresol C_6H_4 (CH_3) OSO_3 are directly sulphated, the indol and skatol become sulphates in a more complex manner, but one so interesting as an illustration of a protective body synthesis, that I shall briefly describe it.

Indol and skatol are too toxic to be absorbed into the circulation unchanged, so the liver proceeds by first oxidising and then uniting them to sulphuric acid, to detoxicate these bodies. The process is as follows: The indol and skatol taken up from the intestine are carried by the portal vein to the liver and there, oxidised to indozyl and skatoxyl, they are then held in loose combination with the protoplasm of the liver cells till sufficient SO_3 has been collected to sulphate them (Herter).

INDOL. — Oxydised in liver to INDOXYL; — And afterwards conjugated with Sulphuric Acid to



(Indoxyl. Sulphuric Acid.)

The liver acts as a living screen protecting the blood and especially the central nervous system from these toxic bodies. It seems reasonable to suppose that in cases of intestinal putrefaction the constant call on the liver to detoxicate the excess of aromatic toxic bodies produced, may, by impairing its efficiency, cause a leakage of these products into the circulation. One sees cases often enough clinically of headache and neurasthenia asso-

ciated with chronic constipation. Another point that strikes one is, that the strain thrown on the liver by excess of such work may permanently affect its efficiency if the cause is continued long enough, rendering that most vital of all organs a less efficient bacteria and toxin filter. It is quite possible that a predisposition to such diseases as enteric, dysentery, or cholera, may be so induced.

The main cause of an increase in the conjugated sulphates, is intestinal putrefaction, the direct cause—as Herter has experimentally shown—being the colon group of bacteria. In all conditions where intestinal putrefaction is increased (obstruction, constipation, or deficiency in the gastric and intestinal secretions) the conjugated sulphates are increased. The high conjugated ratio seen sometimes in diabetes, neurasthenia and some anæmias, is probably due to intestinal causes. Putrefaction elsewhere, such as is caused by long-continued suppuration in the tissues or phthisical lung cavities, also causes an increased excretion of conjugated sulphates owing to the formation of aromatic bodies, similar to those produced in the intestine in putrefaction. In the charts which are given, it will be noticed that the conjugated sulphates are estimated conjointly, any other course would be clinically impracticable. The most important of the group, however (indol), is separately searched for; its presence is so easily determined that this should always be done. In young children indol should be present in but faint traces; any appreciable reaction shows the condition of the intestinal tract to be pathological. In adults the amount of the conjugated sulphates present will be indicated to some extent by the character of the indican reaction. Some of the abnormal colours occasionally seen in urine are due to the aromatic bodies just mentioned, or to closely allied bodies. Both indol and skatol are chromogens and may as such be oxidised to indoxyl blue or still further to indoxyl red. When these bodies are combined with sulphuric acid, oxidation cannot take place, and so ordinary urine does not become blue or red on exposure to air. In some pathological conditions, however, owing possibly to putrefaction in the urinary tract itself, the indoxyl sulphate gets broken up and its liberated indol is oxidised to blue or red. The brown colour of the urine in alkaptonuria is due to the aromatic carboxy acids—homogentisic acid and uroleucic acid. The much more familiar green-brown colour of the urine seen after

the excessive absorption of carbolic acid, is due to oxidised products of this aromatic body—hydrochinon and pyrocatechin.

Urea and the ratio $\frac{\text{Urea Nitrogen}}{\text{Total Nitrogen}}$ find a place in both kinds of schemata. The output of the urea, and especially variations in the ratio just given, are of distinct diagnostic and prognostic value. Urea is the simplest of all the nitrogenous end bodies, and may be looked upon as the physiological end product of nearly all the nitrogenous matter consumed. This simple body with a molecular weight of only 60, is produced in such large amount that its birthplace and the processes by which it is produced are probably many. Urea may be likened to the last link of a chain, the first link of which is the huge and complex albumen molecule, containing its thousands of atoms. This unwieldy albumen molecule is gradually broken down—probably by a process of hydrolysis, through at first complex and then more simple bodies—amides, then leucomaines, and finally ureides to urea. While much of the urea comes from the ureides some also comes from combinations and changes high up in the chain (union of glycocol with the amides), &c. Most of the urea, however, owes its formation to a splitting off of NH_3 from the albumen molecule itself and the junction of this ammonia with CO_2 in the liver. This origin of urea is the most important and interesting clinically. While the albumen molecules are being absorbed through the intestinal wall, ammonia is, by some unknown agency, split off from it and carried in large quantities to the liver, when it unites with CO_2 of the blood and tissues to form urea, $CO<^{NH_2}_{NH_2}$, an amide of carbonic acid. There is no doubt whatever about this origin of urea, for the portal vein is full of ammonia, while the hepatic vein contains practically none ; and if the liver be experimentally shut off from the circulation (Eck fistula in animals) the urea is very greatly diminished and the amount of ammonia correspondingly increased.

Ammonia itself is toxic and the synthesis of NH_3 and CO_2 is possibly a detoxicating synthesis allied to the synthesis described in the formation of the conjugated sulphates, urea being the detoxicated product.

In health then, the NH_3 and the CO_2 join to form urea. The ammonia may, however, be diverted from this, its natural, task, if a more urgent one presents itself. This happens when an acid or acids have been produced in larger quantity by the body than

the liver can oxidise or destroy; ammonia being a base, and a plentiful base at that, unites with the acid which, like the ammonia, is harmful alone, the result is an innocuous and neutral salt.

As the conditions favourable to urea production are (*a*) an efficient liver, and (*b*) little or no acid absorption from the intestinal tract, it is no surprise to find that in severe liver disease such as cirrhosis, acute atrophy, cancer and abscess, and in all cases of excessive acid absorption, the urea output is diminished, either actually or relatively, while the ammonia is increased.

While the lowness of the column $\frac{\text{Urea N}}{\text{Total N}}$ is often due to the increased ammonia alone (fig. 10), in such cases, it may also be caused by an increase of the nitrogen of the uric acid and the extractives generally (fig. 6). It is considered by some that uric acid is a precursor of urea, as I will show later on. In convalescence from acute liver affections, the urea ratio rises and the actual amount is also increased. In point of fact in catarrhal jaundice convalescence is said to be often ushered in by a sudden increase of the urea and urinary volume. While about one-half of the urea is produced in the liver, the other parts of the body produce the rest. In acute and grave diseases of whatever nature, when the metabolism has been much affected, the urea nitrogen column falls (figs. 7 and 8), the loss being accounted for by the increase of the incomplete end products called extractives. So important have some authorities (Robin Grubel) considered the $\frac{\text{Urea N}}{\text{Total N}}$ ratio that they have divided their cases (chiefly enteric) into benign and grave according to the height of the column.

In the charts of enteric fever (figs. 7 and 8), cirrhosis (fig. 6) and one case of diabetes (fig. 10) it will be seen that the $\frac{\text{Urea N}}{\text{Total N}}$ ratio columns are much lower than normal. This condition is due to an increase in the uric acid nitrogen (cirrhosis), extractive nitrogen (enteric), or that of ammonia (diabetes chart).

The amount of urea excreted in acute kidney disease is important, as it enables one to estimate the functional power of the kidneys and be warned of an impending attack of uræmia when the constantly decreasing output shows the waning efficiency of the renal filter. The output of urea is actually though not relatively increased in all conditions where tissue metamorphosis is also increased (such as fever), or when an excess of meat food is being taken as in diabetes. The excretion of urea is often increased in phthisis, owing probably to increased ketabolism.

Preformed Ammonia and its ratio $\frac{NH_3}{\text{Total N}}$.—When writing about urea, I mentioned that one of its chief sources was the union of NH_3 and CO_2 in the liver. I further mentioned that in cases when there was danger of an acid intoxication, the ammonia was diverted from its usual course and was given up to neutralise such acids. Ammonia is the most abundant and least vital of the body bases, other and far more valuable ones being the sodium and potassium of the blood. Whenever there is an increase in the amount of body acid production or interference due to disease with its normal acid oxidising and destroying functions, the urinary ammonia rises.

Increased ammonia production may be due to (1) excessive meat food (here acids are in excess of bases) and to the ketabolism which it stimulates; the body ketabolism itself increasing acid production. (2) An excess of organic acids is produced in the gastro-intestinal tract in dyspepsia and gastro-intestinal fermentations, and failing to be burnt up owing to the concomitant inefficient state of the liver, take up ammonia as a base and increase its excretion (fig. 5). (3) In certain specific fevers, in arthritis deformans, but most important of all in diabetes, when the B. oxybutyric acid may amount to over 200 grammes in the twenty-four hours (figs. 9 and 10). (4) In all conditions of liver insufficiency due to whatever cause, cirrhosis, cancer, acute yellow atrophy, &c., the increased output is here due to two causes (*a*) the inability of the liver to carry out its proper function of urea formation; (*b*) the diminution of its power of acid oxidation (fig. 6).

In some of the above conditions the blood alkalinity may be reduced, especially so in diabetes, in fact in diabetic coma the blood may become acid through over-production of acids and the inability of the body to neutralise such large amounts properly.

In connection with ammonia excretion, I trust a word or two about B. oxybutyric acid may not be out of place. This acid, which is closely allied to the better known bodies—acetone and diacetic acid—is found in most cases of diabetes and to a small extent in some other conditions (specific fevers, &c.).

The amount of this acid excreted is more important than the amount of the sugar, for it is the cause of diabetic coma.

The two cases of diabetes given illustrate very well how necessary it is to know the amount of acid present. In case B. (fig. 10), the amount of ammonia being excreted is 23 per cent. of the

total nitrogen, and the oxybutyric acid 169 grammes or 2·89 per cent.* Here it is evident that the body bases are being used up. In the first case A. (fig. 9), while the oxybutyric acid reaches the enormous amount of 4·9 per cent., the ammonia is actually below normal. The fact is due to the large amount (2 oz. daily) of sodium carbonate being taken by the patient, which by neutralising the acid saves the body base ($N.H._3$). The amount of ammonia passed is a rough index of the quantity of B. oxybutyric acid present, but is not absolutely reliable, as occasionally the other body bases such as the sodium and potassium of the blood are early attacked. As a rule, however, the cheapest body base ($N.H._3$) is first yielded up, and when it is necessary to yield up the more valuable bases, the condition must be pronounced grave and the patient is within the danger zone of coma. The coma of diabetes is considered to be due to the fact that when very large amounts of B. oxybutyric acid are produced, the first body defence—the ammonia—is overcome and the more vital sodium and potassium bases of the blood attacked. The acid by combining with them prevents their carrying away the $C.O._2$, produced in the tissues to the lungs in the form of carbonates, as they usually do. The consequence is that CO_2 collects in the tissues and causes coma. Though this theory has lately been attacked and may some time be disproved, the fact that B. oxybutyric acid is the cause of the coma seems undoubted.

Uric Acid and the ratio $\frac{\text{Uric Acid}}{\text{Urea}}$ will be found mentioned in both schemata, the actual quantity in the percentage schema and the ratio in the schema of columns. I have retained this ratio in the schemata because although the variations of uric acid have not the diagnostic value at one time ascribed to them, yet as the uric acid is found to be abnormally high in certain conditions, it is well to have some system of recording the fact. The amount of uric acid produced was at one time considered to vary directly with the thoroughness of oxidation in the blood and tissues, and was considered to be a half-way product of urea. It is now generally recognised that the chief source of uric acid and of the allied purin bodies is the ketabolism of nucleins, whether derived from the food

* N.B.—Since this paper was written, in September, 1908, I have satisfied myself that the amounts of oxybutyric acid here given, and estimated by the polariscope, are too high. The relative value of the comparison is, however not affected.

or the tissues. Richet has, however, separated out a ferment from the liver which he calls a uroproteic ferment, and which he states is capable of transforming many nitrogenous bodies, including uric acid, into urea. It is probable that some of the urea may be formed in this way. In the charts which have been given earlier in the paper, it will be observed that the uric acid ratio column is particularly high in one of them, viz., the case of cirrhosis (fig. 6). The twenty-four hour's output of uric acid is also seen to be high in fig. 1 in both the tracings of cirrhosis cases.

As a matter of fact in cases of hypertrophic cirrhosis, as in many other liver diseases (acute yellow atrophy, cancer, &c.), the uric acid output is nearly always increased. This increase may be due to the increased destruction of liver cell nuclei, which takes place in these conditions (Herter), or, as Richet suggests, to the diseased condition interfering with the function of the uroproteic ferment. In stationary stages of gout, as will be seen by reference to tracings A. and B. in schema 3, the uric acid output is below normal, this is probably due to defective elimination, for, as will be seen on the same schema (tracing C.), the output is greatly increased towards the end of an acute attack.

The important part played by body nucleins in uric acid formation is well shown in cases of leucocythemia, when the uric acid output is greatly increased, owing to the nucleins derived from the disintegrations of these cells.

The amount of uric acid crystals found in urinary deposits, or the urate sediments so often seen, are, of course, no index of the amount of uric acid present. Uric acid is eliminated in the form of quadurates of soda; these are hyperacid unstable salts which rapidly break up into biurates and free uric acid. The biurates thus formed are acted upon by the acid phosphate of soda present in the urine, and are again changed to quadurates, which again in their turn are broken up to biurates and free uric acid. This reaction goes on till all the uric acid may be set free (Sir W. Roberts). The activity of this exchange depends upon the urinary acidity, amount of acid phosphate present and the concentration of the urine. Uric acid calculi in the kidney are probably due to excessive urinary acidity causing a deposit of uric acid in the organ, for reasons just described.

The Urobilin.—Of the many urinary pigments urobilin is the only one which is regularly estimated. This is because of its

characteristic and easily-recognised spectrum and its clinical significance. Urobilin is derived, as are all the urinary pigments, from the hæmoglobin of the blood; but for the most part its immediate precursor is the bilirubin of the bile. The origin of urobilin is now recognised to be three-fold: (1) Directly from blood hæmoglobin by its reduction in the body; (2) from bilirubin by reduction due to bacteria in the intestine; (3) from both bilirubin and hæmoglobin in the liver. It will be seen by this that any condition which causes hæmolysis, should increase the output of urobilin, and this actually occurs in specific fevers and pernicious anæmia. For similar reasons there is an increased amount in the urine of those suffering from internal hæmorrhages and blood extravasations. There is great dispute as to whether the hepatic or the intestinal origin of urobilin is the more important. Clinically the urobilin of the urine is increased in most hepatic disorders; including jaundice. This point seems to favour the hepatic theory of origin, but many argue that the urobilin is really almost entirely formed in the intestine, and it is because the liver is diseased and cannot destroy the excess that the urinary amount is increased. The uncertainty about its main source of origin does not militate against the value of urobilinuria clinically. It is a sign of hepatic disorder.

The case of cirrhosis given in this paper illustrates well the probably manifold origin of urobilin. While this pigment was always high in this case (fig. 1), it was further and greatly increased on one occasion when the presence of increased intestinal putrefaction was evidenced by the high ratio of the conjugated sulphates (fig. 6).

All the urinary constituents quantitatively estimated in the schemas given have now been mentioned. No reference has been made, however, to urinary qualitative analysis, or the clinical significance of albumen, sugar, the bile pigments, &c., in the urine, as these papers were intended to deal with the less known side of urinary work.

This paper has already reached limits which were never originally intended, or wished for, but before concluding, I would like to call attention to the importance of testing for the presence of albumoses and peptones in the urine. These are generally due, when present, to their leakage through a damaged intestinal wall, or their absorption into the blood from internal suppuration

or necrosis. The presence of albumoses and peptones may tell us the amount of damage which has been done to the intestinal wall by disease, or help us to diagnose obscure cases with deep-seated suppuration. The close association between the presence of oxalic acid in the urine and excessive gastro-intestinal fermentation has been so clearly shown by Helen Baldwin's experiments on dogs (producing oxalaria by inducing a gastritis due to excessive sugar consumption), that it should be searched for in gastric disorders.

The schema of columns which I have put together is but a tentative arrangement and liable to alteration. Two new ratios which may soon be added or displace others in it are: (1) The ratio of $\frac{\text{Organic acidity}}{\text{Total acidity}}$ (Folin's method); and (2) the ratio $\frac{\text{Carbon of urea}}{\text{Total carbon}}$. The former ratio cannot as yet be adopted, as I am quite uncertain as to what the normal proportion is—without this guide the ratio cannot be usefully recorded. The second ratio, $\frac{\text{Carbon of urea}}{\text{Total carbon}}$, I am convinced is of great importance. While the non-calculated nitrogen of the urine, *i.e.*, nitrogen of the extractive, forms but 6 to 7 per cent. of the total amount in the urine, and does not vary considerably, the unknown carbon is in greater amount and in pathological conditions varies considerably. Donzé and Lambling have shown that the non-calculated carbon comes chiefly from bodies like the pentoses, pentosanes, animal gum and oxyproteic acid. Work has been commenced on this ratio, but the results are at present far too few to justify its being used in the schemata.

In concluding, I would like to thank Drs. Dalton (King's College Hospital), Cayley (St. Mary's), and Beddard (Guy's), for permission to examine the urine of their patients and to make use of the charts drawn from some of these analyses.

To Dr. Gilchrist, of Nice, I am greatly indebted both for those of his schemas which he has allowed me to publish and the constant encouragement and advice given me in my endeavours to work at urine. Dr. Gilchrist's collection of percentage schemata (Gautrelet's type) are probably unique and represent the work of years. Colonel Firth has given me great encouragement in my work and help in the production of these papers, and I take the opportunity of thanking him for it.

A short bibliography supplementary to that given in the first paper is added for the reference of those interested.

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DYSENTERY.

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Recent work on dysentery tends to show that amœbæ are not the most common cause of this disease. Colonel Bruce[1] found in his investigations during the war that dysentery in South Africa was not to be attributed to these protozoa. Major W. W. O. Beveridge, who has kindly allowed me to make use of his unpublished results, discovered amœbæ in the dejecta of three cases only out of 147 examined in the A.M.S. Laboratory, Pretoria. Washbourne[2] also failed to observe them. My own observations in Harrismith and Bloemfontein confirm this view. L. Rogers[3] states that in Calcutta the bacillary is much the more frequent form of disease. Strong and Musgrove[4] noted 766 cases of bacillary dysentery to 561 of amœbic among the American forces in Manilla.

While undertaking any attempt to isolate a specific dysenteric microbe, an intimate acquaintance with the protean characters which the common colon bacillus may assume is necessary. These are most concisely given by Horrocks in his "Bacteriological Examination of Water." He finds that the most frequent abnormal varieties derived from sewage and human fæces are :—

(1) Those which conform to the text-book description, except that they do not curdle milk.

(2) Those which do not form indol.

(3) Those which neither clot milk nor produce indol. Thirty per cent. of those isolated by Horrocks came into this class.

(4) Those which neither coagulate milk, generate gas, nor form indol.

(5) Those which do not form gas.

They may also be divided into motile and non-motile.

Some abnormal strains may produce less acid than the enteric bacillus and some may liquefy gelatine.

Environment plays a prominent part in the transformation of one variety into another. Horrocks converted a typical colon bacillus into one which failed to produce indol by growing it in sterile sewage for six weeks. Lesage[5] caused a dysentery colon bacillus which did not curdle milk to acquire this property by a passage on potato, an experiment in which I have also been suc-

cessful. Cany[6] has shown that the administration of calomel to infants will cause the evolution of a new species of coli to the exclusion of that originally present in the intestinal canal. This was recognised by agglutination tests with the serum of animals immunised with the two varieties. Dantec first called attention to the difficulty of obtaining normal growths of the *B. coli communis* in dysentery. Lesage examined twenty-six cases in the first stage of the disease, and in twenty the colon bacillus no longer clotted milk. Later in the illness the normal strains equalled the abnormal, while in the further progress of the case when feculent diarrhœa is established, the *B. coli communis* regains its usual characters. He states he can convert a coli into a paracoli by associating it with a cocco-bacillus or diplococcus which he has grown from the blood and fæces of tropical dysentery. This is 1-2 μ in size, feebly motile, does not retain the stain by Gram, and produces hæmorrhagic septicæmia in guinea-pigs. He finds the readiest way of isolating it is to inoculate rabbits or guinea-pigs with dysenteric stools diluted with water. Pure cultures may then be obtained from the blood. In an earlier paper[7] he had shown that diarrhœa of young calves was due to a similar organism which he proved experimentally could invade the body through the umbilical wound or through the nasal mucous membrane. This is suggestive when it is considered that foul emanations were long thought to be the chief mode of origin. Bruce also has described a micrococcus in the report referred to above. Beveridge has informed me that he found a coccus in 8 per cent. of his cases. These suffered from arthritic complications.

Evidence, however, is accumulating that the bacillus described by Shiga[8] in 1898 frequently originates epidemics. This is a short rod, without vital motility. It does not retain the stain by Gram. Gelatine is not liquefied, nor is milk clotted. It does not form gas in glucose media. Its growth on potato is barely visible. Colonies on gelatine and agar closely resemble those of Eberth's bacillus. It is agglutinated by the serum of bacillary dysentery convalescents diluted 50-200 times.

In 1900 Kruse[9] obtained a similar organism in an epidemic in Westphalia. Drigalski and Schmiedecke[10] met with this bacillus in an outbreak at Döberitz in 1901; Pfuhl[10] also from the German troops returning from China. Müller[11] reports that an epidemic in Southern Styria was caused by this microbe which he identified

by its being agglutinated by serum from a rabbit immunised with Shiga's bacillus. Rosenthal[12] found it in eighty-five cases in Moscow in 1902, the amœba in none. The strain obtained by Flexner[13] in the Newhaven epidemic is identical with Shiga's. Vedder and Duval[14] have referred several outbreaks in the United States to its presence. Duval and Bassett[15] have observed Shiga's bacillus in the summer diarrhœa of children. An army surgeon, R. Doerr,[16] has contributed a most valuable and critical report on an epidemic in Austria in 1902. Lastly, L. Vaillard,[17] "Medecin principal," and Ch. Dopter, "Medecin Major," have published the best paper on the subject with which I am acquainted, founded on 130 cases in the garrison at Vincennes in 1902, which were due to Shiga's bacillus.

For purposes of identification the following are its characters given more minutely.

It is a rod rather thicker than Eberth's bacillus, 1-3 μ long, with rounded ends. No spores are produced, but involution forms with polar staining are common. It will grow on all the usual media, most luxuriantly at 37° C. Aerobic conditions are more favourable than anaerobic. It stains readily with the usual dyes but does not remain coloured under Gram's method. Brownian movements marked, but flagella are not present. Broth becomes cloudy in twenty-four hours, clearing slowly above with the formation of a scanty, greyish white, somewhat viscous precipitate. No surface film develops. The turbidity is greater than in enteric and less than in colon tubes of like age. No indol is produced either in broth or peptone cultures. Gas is not generated in lactose or glucose media.

Gelatine growths are very similar to enteric. They are non-liquefying. The surface colonies measure 2 m.m. in forty-eight hours (Doerr). They are bluish white, transparent and vine-leaf like. Under low magnification the edges seem to be sinuous or serrated and the surface traversed by furrows.

On agar slopes the growth does not extend far beyond the needle track. Individual colonies have slightly uneven borders and are not much raised. They are opal-like and semi-opaque. The odour is characteristic ("Spermgeruch"). Stab cultures in glucose agar give rise to no gas bubbles. Litmus lactose agar, which is rapidly reddened by *B. coli communis*, remains unchanged.

On neutral red agar it behaves like enteric bacillus in causing no appreciable discolouration. The colon bacillus completely discharges the dye.

Lentz[18] states that if stab cultures are made in litmus mannite agar, Shiga's bacillus leaves the medium unchanged. The colon bacillus reddens it and the typhoid decolourises it at the bottom of the tube.

Petrusky's litmus whey becomes feebly acid, slightly in excess of that used by Eberth. The acidity after four days at 37° C. is represented by 6 per cent. of $\frac{N}{10}$ alk. (Doerr).

Milk is not coagulated. In eight or ten days slight viscosity may arise which disappears on gently shaking.

On coagulated serum the growth is yellowish white.

Potato cultures resemble enteric closely in being moist, shiny, thin, and hardly visible. With age they become thicker and more opaque. As in the case of Eberth's bacillus the appearances on potato are somewhat variable.

Barsiekow, Klopstock,[19] Drigalski and Conradi[20] have recently made use of "nutrose," an alkali albumen obtained from milk (sold by Meister, Lucius and Bruning, 51, St. Mary Axe, E.C.), in the differentiation of coli, typhoid, paracoli, paratyphoid, dysentery and pseudo-dysentery bacilli. Extending their experiments, Doerr recommends the following medium :—

1 gramme mannite.
0·5 gramme NaCl.
1 gramme nutrose.
100 c.cm. water.

The nutrose is dissolved by the aid of heat and after filtration 3 c.c. of Kahlbaum's litmus solution are added. It is sterilised by steam for fifteen minutes on two successive days. Shiga's bacillus leaves the colour unaltered as in the corresponding case of litmus mannite agar. The *Bacillus coli communis* causes a flaky curdling of the nutrose after twenty-four hours' incubation at 37° C., while in an enteric culture of the same age there is a marked turbidity, followed a day later by a percipitate. In both these latter cases the sediment takes down the litmus leaving the fluid above clear and colourless. The pseudo-dysentery bacilli redden this medium.

The serum of convalescents, from the stools of whom this bacillus has been grown, will agglutinate the dilutions from 50-200; Doerr says even to 600. Rosenthal says the reaction is wanting during the first week of the illness. From ten days onward it increases rapidly and is most marked in severe cases which end

in recovery. On the other hand, it is low in those which terminate fatally. It d sappears in four or five weeks' time on the average, but may persist many months (Kruse). The whole experience of the authors above quoted shows that a serum from an individual who has not had dysentery will not agglutinate Shiga's bacillus in dilutions higher than 1-50, rarely above 1-10. Since, however, the serum of dysentery convalescents may clump one or more of the whole series of colon and dysentery groups in higher dilutions, it may be, than Shiga's bacillus itself, it alone is unreliable as a means of identification. This is not the case with the serum of goats immunised against Shiga's bacillus. Martini and Lentz,[21] who have closely studied this question, regard the specific serum of a goat as a most trustworthy method of determining the species.

The early experiments proved that cultures were highly toxic to the lower animals and death ensued without the signs characteristic of the disease in man. More recently by subcutaneous inoculation Rosenthal has produced hæmorrhagic and mucous enteritis in mice, guinea-pigs and rabbits. Vaillard and Dopter have also been successful by the same method in reproducing a facsimile of the human intestinal lesion in rabbits, dogs and young pigs. This microbe has evidently a special affinity for the mucous membrane of the large intestine.

Kruse has reported two instances of accidental inoculation in man. In both dysentery resulted. Flexner has recorded that his laboratory assistant was also attacked after inadvertently swallowing some of a broth culture of this bacillus. Strong and Musgrove performed a feeding experiment on a condemned criminal with positive results. The usual period of incubation in man seems to be thirty-six to forty-eight hours.

Shiga's bacillus is destroyed by exposure to a temperature of 58° C. for one hour, and by 1-20 carbolic or 1-20,000 sublimate in a few seconds. Lentz states it will survive in shaded and moist soil several months; Pfuhl found that it withstood drying less than Eberth, while the enteric bacillus survived ninety-seven days in dry linen, Shiga's bacillus lived but seventeen days, and in dry sand Eberth's bacillus grew after twenty-seven days, the dysentery bacillus after twelve days only. It can be recovered from water and milk up to three weeks. In butter and cheese, nine days; fruit and vegetables, eleven days; dejecta, eight days (Rosenthal).

Method of Examination.—A small particle of mucus from a stool recently passed should be mounted on a slide under a cover-glass. If the case be amœbic the field of the microscope will be seen crowded with these actively moving protozoa. If the specimen comes from the early stage of bacillary dysentery but few microbes may be seen on staining with the ordinary basic stains. and still fewer when Gram's method is used. Bruce, Doerr and others have drawn attention to their comparative scantiness in the blood-stained slime of dysentery before the stools have become feculent. In this respect these dejecta offer a marked contrast with enteric, cholera and normal fæces, which teem with micro-organisms.

Another portion of the mucoid material is washed with sterile water and shaken up with a small quantity of broth, agar plates are then made either by incorporating a few drops with the liquefied and cooled agar, or by gently sweeping the surface of agar in a Petri dish with a bent glass rod wetted with the fluid. After twenty-four hours' incubation at 37° C., *B. coli communis* colonies will appear. The glass is marked opposite these and the plate is incubated for another day. Many new colonies will now be visible, smaller and more translucent than the first. These will probably be growths of Shiga's bacillus.

Gay[22] has ingeniously made use of the germicidal power of human blood in separating dysentery bacilli from colon, typhoid and allies. He mixes emulsions of these with the serum of healthy men and plates out after three hours. Only few colonies of the colon and typhoid bacilli will appear, while those of the dysentery bacillus will be numerous. In repeating this experiment I find it is rather difficult of application and does not succeed if the number of bacilli introduced into the blood exceeds a comparatively low limit.

It does not always happen that Shiga's bacillus is discovered in non-amœbic dysentery. Bruce, with his great experience, which he brought to bear on his three months' investigations in South Africa, found that it was impossible to say that any special bacterium played a prominent part in South African epidemics. His bacillus "G." bears many resemblances to Shiga's bacillus, but he grew it from one case only, and clumping reactions were negative.

Kruse[9] states he isolated a rod, to which he attributed asylum dysentery, which differed from Shiga's bacillus in many

particulars. Schmiedecke grew a pseudo-dysentery bacillus from a patient suffering from a relapse of the Doberitz disease. Lentz obtained another pseudo-dysenteric culture from a case of enteritis. All these varieties were agglutinated by a hundred-fold dilution of the serum of convalescents from the fæces of whom Shiga's bacillus had been obtained. Deycke[24] isolated from the spleen and intestinal contents of Constantinople cases a bacillus which produced acid gas and indol.

Strong and Musgrove's bacillus differs from Flexner's two Manilla varieties in its behaviour to maltose-litmus-agar. Neither the former nor the latter two fully resemble Shiga's bacillus, and yet that Strong and Musgrove's cultures exercised pathogenic action cannot be denied since their experiment on man was successful. The serum of a goat immunised with Shiga's bacillus, which will react with this in a five-hundred-fold dilution, fails to agglutinate any of the above in dilutions higher than 1-25.

Some French authors (Arnaud, Courtet and Loir, Comte) attribute to the colon bacillus the power of producing the symptoms and lesions of dysentery, while others (Bertrand and Baucher, Lesage and Laveran) consider that the growth together of two species, which separately may not exert pathogenic effects, may result in ulceration of the bowel. H. Roger[25] obtained a very motile bacterium which liquefied gelatine and curdled milk by injecting the dejecta of Parisian dysenterics into the veins of rabbits. Lastly, Moreul[26] and Rieux isolated growths identical with the above in an epidemic of dysentery in Finistère.

Shiga has prepared a dysentery antitoxin. Two hundred and sixty-six cases treated with this resulted in a death-rate of 10 per cent., while other dysenteric patients were dying at the rate of 35 per cent. Kruse[23] has also immunised horses and asses with Shiga's bacillus, and has obtained a serum which effectually protects guinea-pigs. He finds that a mere trace added to normal human serum is sufficient to prevent the growth of Shiga's bacillus. He has injected it in a hundred cases of dysentery with a mortality of eight. The serum in 20 c.c. injections reduces the purging and tenesmus. He has also used it prophylactically with good effect.

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REPORT ON BLACKWATER FEVER IN THE SOUDAN.

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The occurrence of this disease in the Soudan presents points of special interest, owing to the fact that the country was entirely closed to susceptible people (Europeans and Egyptians) prior to the year 1898; there is consequently a fairly complete record of all the known cases. The locality in which it is endemic has only recently been opened up, so that no hospitals or permanent buildings were available, and owing to transport difficulties medical equipment was cut down to the lowest possible scale. Medical officers consequently had to work under very disadvantageous conditions as regards clinical research, hence these records are not so complete as could have been desired.

Malaria is endemic in its most severe forms in the whole of the Soudan south of Khartoum, and since the reoccupation of the country Europeans and Egyptians—who are equally susceptible—have suffered very severely from the disease. It has, of course, been treated by quinine, large doses of which have been found necessary in the severer forms. Practically all officers and civilian employés—British and Egyptian—carry a private supply of this drug, and are in the habit of treating themselves with it when suffering from "fever," and many take it prophylactically.

No case, however, of blackwater fever occurred in the Soudan until some time after the opening up of the Bahr El Ghazal province. This province and the district of Fashoda lie south of 10° N. lat. The country consists of flat plains and swamps, bordering the Nile and its tributaries. The rainfall is very heavy, the wet season lasting, roughly, from April to November. Forest, or extremely rank grass, cover the ground in all directions near the river, while at some distance from the latter the grass is shorter, but still abundant.

Along the river-banks mosquitoes swarm in myriads. In spite of the extra labour involved in fetching water, the natives will not live within two miles of the river, as experience has

taught them that this is the shortest distance from the river at which it is possible to dwell and escape decimation by fever.

In the year 1901 the province was occupied by the Egyptian Government troops. These were mostly Soudanese, but among them were about thirty Europeans and Egyptians. Opening up this very extensive and unknown country involved rapid marches with but little transport, hence all were subjected to great hardships, especially in the matter of food, which was often scanty and of poor quality. Many of these marches had to be undertaken during the rainy season, and without tents. The whole force (Soudanese included, although to a less extent) suffered very severely from malignant malarial fever; but not a single case of blackwater fever occurred.

In the year 1902 and the first part of 1903 there were in the Bahr El Ghazal province five British offieers and twenty-four Egyptians. Of these, two British officers and four Egyptians were attacked by blackwater fever; both British officers and two Egyptians died, the mortality being thus about 66 per cent. In Fashoda there was a small post in which there were two British officers and a few Egyptians; two of the latter were attacked; one died, the other recovered.

During most of this time the force was scattered in small posts over a large extent of country, and as a medical officer could not be spared for every post, non-fatal cases may have occurred among the Egyptians without being reported as blackwater fever. The numbers given above as being present in the district are, roughly, the establishment for the province; but individuals have not usually remained there for more than twelve months. In two cases the attacks did not occur till the individuals had left the country. One, a British officer, died at Marseilles, on his way to England, about six weeks after he had left the province. In the second case, that of an Egyptian officer, the attack occurred at Cairo thirty-four days after his departure from Fashoda. This case came under my care, and notes of it are appended.

The medical officer in charge of the Bahr El Ghazal province during the year 1902 informs me that he heard that when the French occupied Waw (Fort Desaix), in this district, they were reported to have had several deaths from blackwater fever. He further assured me that in none of the cases occurring under

his personal observation had large doses of quinine been taken habitually previous to the attack. In the case under my care it will be seen that quinine was given immediately before the attack, but owing to the vomiting probably very little was absorbed, as numerous young ring-form parasites were seen in the blood next morning, although not subsequently.

In all malarious countries practically everyone carries quinine and a thermometer with him, and a dose of the former is almost invariably taken on feeling at all "out of sorts," and certainly if a rise of temperature is shown. As blackwater fever is nearly always preceded by a feeling of malaise or an attack of fever, quinine is almost sure to have been taken just before the attack. Before asserting that quinine is the cause of blackwater fever, whether from idiosyncrasy or otherwise, it should be shown that the disease occurs in about the same percentage of cases in every country in which quinine is habitually taken. The geographical distribution of the disease shows that this is not so.

In the Soudan, for example, no case has yet occurred north of 10° N. lat., although the climate and conditions of life, as also the type of malarial fever occurring in other provinces, such as the Blue Nile, Kordofan or Kassala, is much the same, and the quinine habit is equally prevalent. On the other hand, as shown by the recent researches of Christophers and Stephens, and of Daniels in British Central Africa, malarial parasites are almost invariably found in the blood *if looked for early enough*, that is, at the onset of the disease.

Plehn, Fisch and Woldert also found parasites in this disease which they considered, however, presented slight differences from the ordinary parasite of malignant tertian. The disease only occurs where malaria is endemic.

These considerations suggest that the cause of the disease is specific, and that it is probably closely allied to malaria, if not, indeed, a variety of the malarial parasite.

I am unable to obtain any information as to the occurrence of blackwater fever among the natives of the Bahr El Ghazal province; but, apparently, although adults are not very susceptible to malarial fever, the mortality among children is very high, and a large number of children are found to have enlarged spleens.

Notes on a Case of Blackwater Fever.

H. L. (Egyptian), aged 34. Disease: blackwater fever. Admitted to hospital, June 10, 1903.

Previous History. — The patient, who is an officer in a Soudanese regiment, arrived at Fashoda on July 27, 1902. Previous to this he had always enjoyed good health, had never suffered from malarial fever of any kind, and indeed had never visited a malarious district. While at Fashoda he had repeated attacks of malarial fever, lasting from three to six days, and yielding readily to quinine. He assured me, however, that he only took quinine when he was actually ill with fever, and never as a prophylactic. After a stay of less than ten months he left Fashoda on May 6, 1903, to proceed to Cairo on leave. Since his arrival in Cairo he has had two very slight attacks of fever.

Present Illness. — Patient states that he was seized with nausea and vomiting on the evening of June 9, 1903, at 6 p.m. He went to the nearest doctor, who gave him calomel, grs. 10, and quinine grs. 15. His temperature at this time was 101° F. At 10 p.m. he passed blackwater, and again at 4 a.m. and 8 a.m. on June 10, 1903. Vomiting recurred at intervals from the onset, but he did not suffer any pain.

Condition on Admission (10 a.m.).—The patient was well-nourished, but somewhat anæmic; skin and conjunctivæ markedly jaundiced; pulse 120, soft and compressible; temperature 101° F. Heart and lungs normal. The spleen was enlarged and could be easily felt; the vertical dulness measured six inches. The liver was somewhat enlarged and tender on pressure. Urine, sp. gr. 1020, acid and clear. The colour was of a deep port wine hue. Albumen was present to the extent of one-eighth; the tests for sugar and bile (colouring matter) gave a negative result. Examined microscopically no blood corpuscles could be detected. The guaiacum and ozonic ether test produced a deep blue line. The sediment consisted of a few hyaline casts and some yellow amorphous masses.

Blood. — Numerous malarial parasites were present; these were entirely small ring-forms; the leucocytes contained many pigment granules.

Treatment.—Calomel grs. 6, by the mouth; quinine hydrochlor. acid, 0·5 gramme (8 grains), hypodermically at 11 a.m. and 5 p.m. A sinapism to the epigastrium.

June 11, 1903.—Skin and conjunctivæ more deeply stained—in fact, saffron colour. The patient vomited three times during the night, but not since 9 a.m. this morning. The urine passed early this morning resembles that of yesterday; the later urine (11 a.m.) was as follows: Colour, orange; sp. gr. 1015, acid; albumen considerable; guaiacum and ozonic ether gave a blue colour. The patient does not complain of any pain, and says that he slept well. Treatment, quinine repeated as yesterday.

June 12, 1903.—Much improved. Urine, sp. gr. 1015; colour, yellow; albumen less; hæmoglobin, but no bile. Treatment continued as before.

June 13, 1903.—Improvement maintained; yellow colour fading; spleen smaller.

June 14, 1903.—Yellow colour nearly gone. Temperature and pulse returning to normal. Quinine continued as before.

From June 15, 1903, the temperature remained normal, and recovery was uninterrupted. Quinine, grs. 5, three times a day, was given by the mouth.

NOTE ON THE OPERATION FOR RUPTURED ENTERIC ULCER.

By Surg.-Gen. W. F. STEVENSON, C.B.
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Now that it has been acknowledged that Army Medical Officers are beginning to be able to recognise enteric fever when they see it, it may be of service to bring to their notice in the Journal the important subject of the treatment of that very fatal complication so common in these cases, namely, rupture of one or more of the ulcers which are pathognomonic of the complaint, as well as some statistics showing the expectation of successful results from surgical interference for conditions otherwise almost hopeless.

Operation for ruptured enteric ulcer is in this unfortunate position, as compared to other surgical procedures, that it cannot be expected to remove the cause which gives rise to the necessity for it. It may remove and neutralise the effects of a ruptured ulcer, but it does not tend to interfere with the disease to which the ulceration is due, nor to prevent its continuing and producing other similar ruptures. The recoveries therefore after the operation are not numerous; but they are more so than they were for some time after it was first performed, and they are likely still further to increase as the delay which is allowed to take place between the onset of symptoms and the interference of the surgeon is diminished; for the sooner the operation is performed after the signs of rupture show themselves the greater is the probability of success.

In the *Transactions of the Clinical Society* for 1902, Mr. H. I. Waring gives the results of five cases operated on by him, of which two recovered. Dr. Carr and Mr. Roughton state that only seven cases had recovered from the operation in the United Kingdom up to date, but Mr. Bowlby adds another of his own in the same volume; but in neither case is the total number of operations given. Senn, of Chicago, gives forty-nine cases with thirty-seven deaths, or a death-rate of 75·5 per cent., while Keen gives statistics of eighty-three cases with a death-rate of 80·8 per cent. From these figures, then,

it would appear that the average mortality of these operations is about 78·1 per cent. But while the results of operation may be as bad as those just given, it should be remembered that the death-rate from perforated enteric ulcer is far worse when operations are not performed.

The gravity of perforation and the fatality of operation depend very largely on the general condition of the patient when the complication occurs. Thus, if it happens during the height of an attack of enteric fever, between the fourteenth and twentieth days, the chances are very much more against recovery than if perforation occurs during convalescence or in the course of a relapse, when the patient is likely to be better able to withstand the effects of the accident and to bear operative treatment. Indeed, in the former case recovery is almost hopeless, while in the latter the expectation of life is fairly good.

The last two feet of the ileum is the site of the perforation in the vast majority of the cases in which it occurs; but the large intestine cannot be excluded, the sigmoid flexure being a fairly common part of the gut for the opening to be found in.

The operation should be performed as soon after it becomes evident that perforation has occurred as possible. The incision should be in the middle line, beginning close above the pubis and extending to the umbilicus, or even higher; this incision gives the best access to the various parts of the intestine in which the perforation may have taken place. The cæcum should first be found, and the lower end of the ileum examined for the perforation, all procedures for this purpose being carried out with the greatest gentleness lest other ulcers be broken into. If the patient be in an extremely bad condition it may not be possible to carry out any prolonged suturing operation; under these circumstances the best that can be done is to bring the perforation to the surface and attach a healthy part of the intestine to the skin, leaving the abnormal anus thus formed to be dealt with later on, if the case recovers so far. Thin silk is the best suture material, the Lembert stitch being used and the ulcer being turned in, not excised. The line of suture should be transverse to the length of the gut, as this produces less diminution of its calibre than if it was longitudinal. Next in importance to making a water-tight seam in the gut

is the washing out of the peritoneal cavity. Free irrigation with boiled water, normal saline, or boric solution should be practised, especial attention being paid to the recto-vesical pouch, and the irrigation should be assisted in cleaning out the deeper parts of the pelvis by the use of pledgets of gauze wrung out of the solution for removing the extravasated intestinal matter. Whatever fluid is used for irrigation it should be hot —105 to 110° F.—in consequence of the well-known good effect of hot irrigation in combating shock and collapse. When shock and collapse are well marked, half a pint, or more, of normal saline solution may be left in the recto-vesical pouch when the incision is closed, as its rapid absorption acts in the same way as intravenous injection.

All incisions for abdominal operations should be closed by three layers of suture, two of catgut for the peritoneum and muscles, and another of silk or silkworm gut for the skin.

RUPTURE OF AORTA.

By Lieut.-Col. DRAPER, R.A.M.C.

Pte. W. P., Royal Lancaster Regt., aged 24, service six years, was admitted to the Military Prison, York, on February 24, 1902. His general health had been good, and there was no history of sickness of any kind. His committal sheet certified that he was "free from disease and fit to undergo punishment." When I examined him on admission he reported himself to be in good health, and there was no evidence of any physical defects. He never at any time reported himself sick during the period of his imprisonment. I last saw him alive on my weekly sanitary inspection parade on April 17, 1902. He then made no complaint, and appeared to be in good health. I am informed that he was of an active and cheerful disposition, and that he performed his duty as usual without complaint. He was last seen alive by the warder's wife at 5 p.m. on the 19th inst., who observed him reaching something off his shelf in his cell. A few moments later he was discovered, laid face downwards across his bed, quite dead. At a coroner's inquest, held on April 22, 1902, a verdict of "Death from natural causes" was returned.

Post-mortem examination revealed extensive rupture of the ascending portion of the arch of the aorta, in the muscular coat of which was deposited an atheromatous mass. This deposit had probably been of slow growth, and it appeared to have given rise to no inconvenience or serious consequences up to the time of death. The pericardium was full of blood. All the other internal organs were normal. The deceased was well nourished and of good physical development. There were no marks of violence on his body. I am of opinion that the degenerated condition of the aorta and its subsequent rupture were the cause of death.

FRACTURE OF SKULL. CONTRE-COUP.

By Major G. DOUGLAS HUNTER, D.S.O.
Royal Army Medical Corps.

The following case may be found of interest, not only from a surgical, but also a medico-legal point of view, as showing how a serious injury may exist without definite evidence of its presence. At first there was no history or appearance of injury having been inflicted, until attention was drawn to its possibility by rumours that the man had been assaulted. The patient himself was sensible, and could talk and answer questions, but did not allude to the fact of having been injured. Later, on being closely questioned on the point, he gave a somewhat confused account of having been struck or fallen down, being evidently under the effects of liquor at the time. Below I give the case in detail, as taken from the medical case sheet :—

July 26, 1903.—Pte. Henry G——, Glo'ster Regt., aged 24, reported sick to-day at the Station Hospital, Naini Tal, complaining of pains in the head, and stating that he had been getting fever lately; tongue very dirty, temperature normal; rather drowsy condition, and had undoubtedly been drinking. Being under orders to go down to the plains, he was detained for observation. Bowels acted freely after calomel and white mixture; evening temperature normal.

July 27.—Morning temperature 99°. Not being considered fit to travel, he was admitted to hospital. Still complains of headache; drowsy, confused state; tongue very dirty; saline purgatives and bromide of potassium. Evening temperature normal.

July 29.—Temperature has been normal since last note. I was told to-day that it was said he had been struck on the forehead and knocked down. There are *no signs* of a blow on the forehead; on examining head a small swelling was noticed, $1\frac{1}{2}$ inches to the right of median line of vertex and 4 inches above eyebrow. Right side of head shaved; swelling was evidently a small hæmatoma, about $\frac{3}{4}$ inch in diameter, boggy, no contusion or bruising of skin over it. Complains of

pain, especially on right side of head; hæmatoma is evidently not due to direct external violence. Cold evaporating lotions applied to head. He continues in a very drowsy lethargic state; tongue very foul; only speaks when spoken to; pupils regular and respond to light. There is slight facial paralysis on left side; tongue slightly affected. No paralysis of limbs on left side; moves freely in bed, tries to get up, and seems generally dazed and confused. Salines, bromide. Evening temperature 101°.

July 30.—Morning temperature 100·4°; much the same condition. Evening temperature 99·6°.

July 31.—Morning temperature, 99°; facial paralysis is more distinct; pupils not affected. Complains of pain on vertex and back of skull. Answers when spoken to. Tongue still very foul; bowels opened by salines and enema; in the same drowsy, confused state. Free motion of limbs on left side, but sensation seems affected; speech is rather blurred and indistinct. Respiration 18; pulse 76; evening temperature 100·4°.

I was sent for about 10 p.m. Patient had a convulsive seizure, face very livid, convulsions general; but left side said to be most affected. On my arrival at the hospital convulsions had ceased, and he was sleeping quietly. Respiration 18; pulse 72. The patient's condition and symptoms clearly pointed to compression of brain, probably due to hæmorrhage.

August 1.—Temperature normal. Had a fairly good night; bowels freely moved this morning. Has had three convulsive seizures this morning; they are increasing in intensity—very livid during the attack. Facial paralysis of left side is well marked. He is roused with difficulty, but answers when spoken to. Respiration 16; pulse 56. Patient's condition most serious.

After consultation with Capt. McCarthy, R.A.M.C., I decided to cut down and examine condition of skull in region of hæmatoma. Head completely shaved. Two slight bruises at back of scalp on right side below occiput; no bruising or contusion over hæmatoma, which was boggy to touch. All instruments, dressings, &c., well boiled and sterilised. Capt. McCarthy administered chloroform, and Capt. Hulbert, I.M.S., kindly assisted me during the operation. A large D-shaped flap was taken around hæmatoma on right side of skull, base down-

wards, and right parietal and frontal bone well exposed. The hæmatoma was found to be due to hæmorrhage, caused by a small spicula of bone projecting outwards from the coronal suture, and a linear fracture was seen in the course of the coronal suture, or rather what appeared to be a separation of the suture, forcing outwards the small spicula of bone, probably the result of "contre-coup." At the spot where the small piece of bone was projecting, slight oozing of blood was noticed, apparently from within the cranium. The fragment of bone was cut away, the pin of the trephine applied over the spot, and a circle of bone removed in the course of the coronal suture. On exposure of the interior of the cranium, the dura mater above the coronal suture was seen to be normal, but below the line of the suture a blood clot was found lying on the dura mater, and extending forwards below the frontal bone. The clot was gently picked out and removed, and fragments washed away by weak perchloride solution. There was some oozing from what was apparently a small anterior branch of the middle meningeal artery, which soon ceased after exposure to the air for a few minutes, The circle of bone removed by trephine was kept covered by the skin flap during the operation. It was then washed in a weak antiseptic solution, and replaced *in situ*. The flap was readjusted and stitched, except at the lower anterior part, which was left open for drainage. Wound well dried and dressed with dry pad of boric wool. Patient bore operation well. In the afternoon there was a slight convulsive seizure which did not last long. Evening temperature 98·8°; pulse 84; respirations 18.

August 2.—Temperature normal; good night; quite sensible; eyes clear and bright. Says he has no pain, and speaks quite distinctly; bowels open. Evening temperature normal. Dressings not disturbed.

August 3.—Temperature normal. Says he feels quite well; no pain. Wound dressed; upper and inner part of flap where stitched almost healed. Evening temperature 98·8°.

August 6. — Temperature normal. Stitches removed; flap quite healed except at lower portion, which was kept open. Speech normal; no pain. Says he feels very hungry. Tongue clean.

August 12.—Good appetite; lower part of wound almost healed.

August 20.—Up and about; no symptoms of paralysis. Sleeps well, appetite good, wound entirely healed. Convalescence was uninterrupted. He appeared before a Medical Board on September 18; was recommended change to England, and left Naini Tal *en route* to England on October 19, 1903, looking well and strong. It will be seen from the above description of the case that there were at first few symptoms to point to any serious injury of the skull or existence of meningeal hæmorrhage. The evident symptoms of a drinking bout before admission, absence of history, or external signs of injury, completely masked the brain symptoms. When symptoms of facial paralysis supervened they were of slight character, and there was complete absence of paralysis of limbs. It was not until the fifth day after admission that I felt assured that the symptoms were due to brain pressure, and the assurance was strengthened by the convulsive seizure, which occurred on the evening of July 31. The case is, I think, a satisfactory one from a surgical point of view, and the fracture was, from its appearance, undoubtedly due to "contre-coup."

NOTES ON THE RED LIGHT TREATMENT OF SMALL-POX.

By Capt. F. E. GUNTER.
Royal Army Medical Corps, Peking.

In connection with Professor Finsen's article on the Red Light treatment of small-pox, the following three cases, which occurred last winter in the British Legation Guard, may be of interest.

(1) Pte. R——, 1st Sherwood Foresters, aged 24, admitted to hospital November 29, 1902, with fever and pain in the back. There was a marked purpuric rash chiefly in lower abdomen and Scarpa's triangle. The true eruption, which was almost confluent, appeared on November 30, 1902. By December 31, 1902, he had recovered without the slightest scar.

(2) Gunner M——, R.G.A., aged 23, admitted December 7, 1902, with fever. There was no initial rash. A marked eruption appeared on December 8, 1902. He suffered throughout from constipation. He was discharged from hospital January 16, 1903; slight scarring.

(3) Gunner A——, R.G.A., aged 24, admitted December 8, 1902, with pain in the back; eruption very scattered. Temperature fell by lysis. No pitting. Discharged January 16, 1903.

These men were all treated by the exclusion of the chemical rays by means of red cloths hung over the windows and doors of the ward.

Case 2 is rather remarkable. He was lying near a window. Although this was covered with a red curtain it was rather a thin one, and the direct rays of the sun probably penetrated. Thinking of this, and noticing that the eruption appeared very virulent, Assist.-Surg. de Costa had him removed to a darker part of the ward. The result was most marked. The vesicles began to subside and a man who was apparently going to be badly marked recovered with practically no scarring.

Small-pox is extremely common amongst the Chinese in Peking, and they do not regard it as a serious disease, and rather laugh at the precautions we take against its spread.

They are great advocates of the red light treatment, which they have used for many years. They also say that extreme quiet is of value. I am bound to say that you meet in this city numbers of men and women badly marked with small-pox, but probably these have not carried out the prescribed treatment.

INNOMINATE ANEURYSM: LIGATURE OF THE COMMON CAROTID AND SUBCLAVIAN ARTERIES: CURE.

By Major M. P. HOLT.
Royal Army Medical Corps.

P. C. was transferred to Dublin on September 10, 1903, with the following note :—

"Admitted at K. Station Hospital on August 8, 1903. There is a swelling about the size of a large hen's egg above and to the right of the top of the sternum, oval in shape, about 2½ inches long, immobile, lateral expansile pulsation, dysphagia on eating bread, and pain on right side of neck, occasionally shooting down to the right fingers. Swelling first noticed by patient about fourteen days ago. Probably an aneurysm of right innominate or commencement of carotid artery."

On arrival at Dublin there was obviously an aneurysm of the bifurcation of the innominate, implicating both the common carotid and subclavian arteries. The swelling was soft and prominent; it extended about 2 inches upwards from the right sterno-clavicular joint, and about 2½ inches outwards to the right above the clavicle; the sternal end of the clavicle was distinctly pushed forwards well in front of the level of the opposite clavicle. The patient was positive that no swelling had existed prior to fourteen days before admission to hospital at K. Arrived in Dublin under the influence of alcohol. Complained of pains shooting down the arm and up to the base of the skull. There was a very constant and short hacking cough. No bruit could be heard over the swelling, which otherwise presented all the classical signs of aneurysm. There was distinct asynchronism of the radial and temporal pulse. During the next few days, although he was kept in bed on milk diet, the swelling steadily increased in size. There was no dysphagia with the milk diet.

On September 17 Sir Charles Ball saw the case very kindly in consultation, and recommended ligature of the common carotid in the first instance.

On September 18 the common carotid was ligatured above

the omohyoid, some difficulty being experienced owing to (1) the patient being a stout man with thick neck; (2) the very considerable engorgement of even the small veins from pressure at the root of the neck; and (3) the limited area available owing to encroachment of the tumour in the field, the tumour reaching now to the level of the cricoid cartilage. A double ligature of kangaroo tendon was applied. So far as could be observed the ligature produced no cerebral effects, the pupils were unaffected, remaining equal in size. Chloroform was the anæsthetic used.

On September 24 the wound was dressed and found to be healed.

Note.—"There is little change in the tumour."

It was noticed that there was some degree of left wrist-drop. He volunteered the information that he woke up the previous morning and found his arm (left) lying across the iron framework of the bed-cot (Macdonald pattern), and felt a numbness at the back of the upper arm, so that there was a probability that the paresis was of musculo-spiral origin and temporary, and in no way connected with the altered condition of the central nervous circulation.

September 27.—Dressing removed and the stitches taken out. The aneurysm *in statuo quo*. Compression of the third part of the subclavian artery by finger pressure produced marked diminution of the pulsation in the aneurysmal swelling.

September 29.—No further increase in the size of the tumour. but the pulsation is less vigorous than before the operation. No cough. No pains shooting up towards head.

October 2.—A skiagraph was taken. There appeared some doubt as to the shadow of a swelling extending downwards into the mediastinum, the plate being still wet.

October 5.—The third part of the subclavian artery was ligatured. Again some difficulty was met with in exposing the vessel owing to the stoutness of the patient and the engorgement of the veins, as well as the displacement of normal relations owing to pressure of the tumour, which reached to the anterior scalene muscle. Kangaroo tendon was used. The artery was ligatured in two places ½ inch apart; the vessel was not divided between the ligatures. The limb was well wrapped up in dry wool, bandaged to the side, and hot-water bottles laid along it.

It was noted before the operation that there was considerable loss of power in the left arm, as well as the wrist-drop noted on September 24.

October 6.—Right arm remains warm and comfortable.

October 8.—Dressed. He had loosened the bandages somewhat. Wound all clean and dry. Arm warm and comfortable. He objects to having the arm fixed to side. Still strong pulsation in the aneurysm. A further examination of the plate taken on October 2 shows a marked rounded shadow to the right of the ascending arch of the aorta, and it is thought by some to indicate aneurysmal dilatation.

October 11.—As yet no decrease in size of aneurysm.

October 15.—Dressed. Stitches removed. All healed. The tumour apparently still increasing with marked expansile pulsation.

October 19.—To-day noted for the first time that the tumour is distinctly less both in size and tenseness, the pulsations are much more feeble, but there is reason to doubt that this improvement will continue.

October 24.—Tumour undoubtedly lessening in size; the scars of the two incisions are now well clear of the swelling, whereas in the first instance the incision in each case extended well on to the tumour. The swelling still reaches into the suprasternal notch.

November 5.—Tumour still continues to diminish at a rapid rate and now only a faint transmitted pulsation can be felt; tumour scarcely projects beyond normal level of skin.

November 13.—The tumour as such has disappeared; there remains now to be felt only a small hard lump, deep down on the course of the innominate artery and giving, of course, a faint transmitted pulsation.

November 17.—Allowed up; apparently quite cured.

December 1.—The case was shown at a meeting of the Royal College of Physicians, Ireland. Two of those present had seen the case before operation.

December 2.—Discharged from hospital. Not yet recommended for duty.

Notes.—The patient has a very bad history of syphilis. He was in hospital in 1892 for secondary symptoms for 49 days, and in 1896 for 111 days. In addition to these there are entries for local sores (soft), warts, &c., as follows: 1893, 100

days; 1895, 23 days; 1896-97, 97 days. He was also obviously addicted to alcoholic indulgence, and not in any way a favourable patient for ligature of large vessels. He gives his age as only 31, but looks much older. The rapid increase in size of the tumour compelled me to accept all risks. Great apprehension was felt as to the possible effect on the cerebral circulation of suddenly cutting off 25 per cent. of its supply. The apparent musculo-spiral paralysis noted on September 24 was very disconcerting; undoubtedly there was reason for musculo-spiral traumatism, but then the loss of "hand-grip" power was so noticeable at a later date that central anæmia could not be with any certainty excluded entirely. There is now no appreciable difference in the arm and hand power of the two sides, but of course the collateral blood supply on the right side can hardly be so sufficiently established as to warrant the supposition that the right arm muscles are of full tonicity.

The use of the word "cure" may possibly be objected to, since any aneurysm through any part of which blood is still permitted to flow may not be looked upon as permanently cured, even though all the symptoms and evidence of its previous existence may have disappeared; this reservation is accepted whilst using the word "cure."

Iodide of potassium was prescribed in large doses before the first operation, when it was stopped. It was resumed on November 13; its exhibition can have had no influence in the cure. Both wounds pursued a perfectly aseptic course. The temperature only twice rose to 99° F.; once on the evening *previous* to the first operation, and again on the fourth morning after the first operation before the bowels had been opened by aperient medicine, otherwise it was always normal. It is usually recommended that double distal ligature for innominate aneurysm should be performed simultaneously; in this instance ligature on separate occasions does not seem to have prejudiced the result. Ligature of the vertebral immediately behind the upper part of the aneurysm would have been most difficult, if not actually impossible.

The association of a large aneurysm with moderately severe history of syphilis will be noted, though there is no proof that such association is one of cause and effect. The probability of diseased cerebral arterioles in a syphilitic subject was borne

in mind when considering the risks of interfering with the cerebral circulation.

Cases of successful results in this operation are sufficiently few to warrant the present one being put on record.

ADDENDUM.

The "scheme" of treatment intended was as follows: (1) To ligature the common carotid and subclavian arteries either simultaneously or separately; (2) to ligature the innominate artery a few weeks later. The rapid subsidence of all symptoms and evidence of the aneurysm at present offers no justification for the second stage of the proposed treatment, the possibility of recurrence at a later date of the symptoms must be self-evident.

There is a manifest objection to ligature of the innominate in the first instance, such ligature entails the sudden deprivation of the brain of 50 per cent. of its blood supply, whereas by a preliminary ligature of the common carotid only some 25 per cent. of such supply is cut off in the first instance; then at a later date if the innominate be ligatured only some 33 per cent. of the then present supply is shut off and the liability to extensive cerebral anæmia or coagulation within the cerebral circulation is much lessened. In a recent case of ligature of the innominate by Mr. C. A. Ballance,* death took place some thirty hours after operation from extension of thrombosis to the middle cerebral artery, and the suggestion is put forward with considerable diffidence that liability to this accident would be less were the right vertebral artery still patent when the common carotid is tied, the vertebral being occluded at a subsequent date as was intended in the present case, when, however, further interference is not now called for.

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* *Lancet*, November 1, 1902, p. 1180.

BELLARY: ITS CLIMATE AND POSSIBILITIES.

By Lieut.-Col. H. K. ALLPORT, Bellary.

Bellary is a considerable civil and military station near the large native town of the same name. It is connected with Guntakal by the Hubli-Bezwada section of the Southern Maratta Railway, and easy to reach from Bombay (twenty-four hours) or Madras (fifteen hours). It is situated on the Deccan plateau, 1,500 feet above sea-level. This circumstance and its proximity to the Sandur hills, about twenty miles away towards the west, determine the local climate. Few agree as to the advan-

tages or disadvantages of the place. It is popularly supposed to be one of the hottest stations in South India, and a forsaken hole to boot. The winter's experience is, however, favourable, and the discerning reader may make due allowance for this bias. The climate has been compared to that of Secunderabad, but it is a little hotter. It may conveniently be divided into the cool weather—not cold—from November to February, the hot weather from March to June, and the monsoon season from July to October. Although the temperature during each of the above periods are relatively high, the effect of heat on one's health and the sensation of heat are less than at places where the actual temperatures are lower. This

is owing to the comparative long cool portion of the day and the constant breeze. Even in the hottest weather the nights are cool, and one can always count on a refreshing sleep either under the stars in the open, or under a punkah. The cool weather is always pleasant, and English summer clothing can be worn; at night especially, warm covering is necessary. It begins to get hot in March; April, May, and part of June are very hot, the thermometer registering over 100° F. during the day, but even then refreshing nights usually follow. About the middle of June the S.W. monsoon bursts with the usual accompaniments; but later the wet clears off, the rain-clouds being stopped by the Sandur range of hills, and most pleasant weather with cool breezes and cloudy skies is the rule until the N.E. monsoon begins to blow again in October. So much for the climate.

After climate one's house is important. Houses are few, and many bad. The writer occupies one of the best, and hopes to pass it on to his successor. Our people do not always keep this in view, and so we lose good bungalows that with a little management might be passed on and kept as R.A.M.C. houses, one officer succeeding another in occupation. There is an interesting old bungalow at one time occupied by the Duke of Wellington; but its situation is unfortunate, as it suffers from the radiated heat from the fort rock.

Good food can be obtained. Fresh sea fish and ice are brought daily by rail from Madras. There are good shops for stores, which may also be had from the Army and Navy Co-operative Society, Bombay, or from Madras. A cook is important; there are a few good ones. The kitchen and cooking require supervision; butter, not ghee, should be used in cooking. Good bread is obtainable, and the R.F.A. dairy supplies clean wholesome cream and butter.

There are, as everywhere, two classes of servants—good and bad. The writer's experience has been most favourable.

Game is plentiful near the station and in the surrounding district. Snipe, duck, partridges and quail may be picked up in an afternoon walk with a gun. There is better shooting to be had along the line towards Hospet, including black buck, leopard, and pig. The jungle close to Bellary is very difficult on account of the growth of prickly pear; but three days'

station leave, and a short run by rail, will bring one into good shooting grounds. A camp bed and well-fitting mosquito curtains ought to be carried on those expeditions, as malaria is prevalent and virulent, especially during the shooting season.

Socially the place can be made very pleasant. There is a fairly good club where people meet in the afternoon, and occasionally in the evenings for dances or dinners. There are also tennis courts, a race-course, polo ground, and golf links. Bellary is not considered a "pretty" place, but it has a great deal of character. The ground is slightly undulating, and broken by masses of red rock; the whole is dominated by the immense isolated mass of the fort rock rising to about 450 feet above the plain, and capped by Hyder Ali's fort. The citadel is not occupied, but the lower fort at the base of the rock is guarded by a British guard, and contains many Government buildings. The writer considers Bellary one of the most picturesque places he has seen in India, if the searcher after the picturesque be content to look for it among the people and the streets of the bazaars; here, as elsewhere, this characteristic is hidden beneath the obvious. It is intensely eastern, and there is always the good-humoured ragged crowd, with beautifully dressed women sometimes to be seen; for the better class Hindus are not *pendah,* and their women can walk abroad, especially on feast days, and in the quieter streets. The present garrison is a wing of British Infantry, one Battery R.F.A., a Native Cavalry, and a Native Infantry regiment. The station is in the Belgaum district, and is under the command of a Colonel on the Staff. The station hospital is a fine double-storied building and is equipped for seventy-two beds. Hot weather dress, khaki and white, is worn all the year round. There is a good deal of sickness among the British troops; a large proportion, however, is due to causes that would be preventable if the men themselves assisted the efforts of the authorities. A few cases of enteric occur, and malaria is prevalent after the autumnal rains. Thirty-five miles away is the small hill sanatorium of Ramandroog, where there is accommodation for about eighty men. There are a few private bungalows, but they are in bad repair. If a thorough change of climate is necessary the Nilgiri hills offer a choice of stations and are not very difficult to reach.

NOTES ON A CASE OF CHRONIC SYNOVITIS, OR BURSITIS, DUE TO THE ORGANISM OF MEDITERRANEAN FEVER.

By Lieut. J. CRAWFORD KENNEDY.

Royal Army Medical Corps, Malta.

Pte. C., 3rd Garrison Regiment, was transferred to my ward, diagnosed chronic rheumatism of the right shoulder, about the end of October, 1902.

History.—Patient had been in hospital from April 17, 1902, to April 30, 1902, suffering from subacute rheumatism (?), contracted after a wetting. After his discharge from Hospital he suffered from persistent pains in his various joints; they finally settled in his right shoulder, which swelled up, and compelled him to come to Hospital on August 30, 1902. No treatment had been of much avail; he derived most relief from hot fomentations.

Condition on Transfer to my Ward.—General health and appetite good; slightly anæmic. An evening rise of temperature to 99°. Shoulder-joint was marked with recently applied blisters, much swollen and tense, very tender to touch; deltoid muscle was much wasted, and fluctuation could be detected at the anterior and posterior borders of the muscle. I considered that a large subacromial or subdeltoid bursa was chiefly involved. The arm was practically useless on account of the pain on movement, and rather wasted and flabby.

On October 29, 1902, I tested a sample of his blood serum for Widal's reaction to Mediterranean fever, but with a negative result. Dilution used $\frac{1}{40}$. On November 10, 1902, I drew off by means of a hypodermic syringe a small quantity of the fluid, and injected 20 min. of 2 per cent. solution of carbolic acid. Some of the serous fluid I spread over an agar slope and incubated at 37° C. Microscopic examination revealed a few very minute cocci floating about in small clumps of three or four or five. The relief to the patient after this slight operation was most marked; the pain vanished, and his temperature, which had risen to 100° on three previous nights, fell to normal. The tension was much less, and seemed to

grow less for four days, but then became stationary. On the evening of November 17 the temperature ran up to 101°, and next morning I drew off ʒvi. of serous fluid from the bursa by piercing the deltoid with a hypodermic needle just below the acromion process, and injected 20 min. of 1 to 80 carbolic lotion. I also incubated a sample of this serum on agar slope. After the second operation patient's recovery was rapid and uneventful, and his temperature fell to normal in five days, though on the third day he had a rigor and the temperature rose to 103.° It took him some time to regain the use of his muscles, but the joint condition never gave him any more trouble. The result of the bacteriological examination was as follows: The second sample, of serum drawn off gave no growth on agar. The first sample, viz., that drawn off on November 10, 1903, gave a growth of two colonies, which were just perceptible on the third day, but were well developed on the fourth. The growth had the characteristics of a growth of *Micrococcus melitensis*. Stroke on agar. A subculture gave a uniform white streak in twenty-four hours. Microscopically it was a very minute coccus (?), emulsifying readily and indistinguishably from the *Micrococcus melitensis*. It was not stained by Gram's method. It was agglutinated by serum taken from a case of Mediterranean fever diluted to 1 to 30. When inoculated into a guinea-pig intraperitoneally a typical blood serum reaction was obtained with a laboratory culture of *Micrococcus melitensis* on the fourth day after inoculation. There is, therefore, no doubt that the organism discovered was the organism of Mediterranean fever.

The patient's blood serum was tested on two different occasions, viz., October 29 and December 12.

I obtained no reaction to Mediterranean fever by Widal's test, but I am now of opinion that the dilutions I used then (viz., $\frac{1}{40}$ and $\frac{1}{100}$ respectively) were too high. Experience has since taught me that in the above class of case—cases with slight but long-continued fever and severe localised symptoms—the blood reaction is usually very low, and may be missed if a dilution of over 1 to 30 be used. It may be presumptuous to make deductions from one case and to generalise, but I think this goes to prove that the severe localised symptoms that one gets in Mediterranean fever are due to an actual

deposit of the *Micrococcus melitensis* in the affected tissues, causing localised inflammation. This means that the organism must be in the circulation, if not constantly, at least in certain stages of the disease. One is able in many cases to assign some external exciting cause for these local affections, viz., exposure (Hughes), twist, strain; the region of shoulder-joint is very commonly affected in hospital patients, and is undoubtedly caused in some cases by the patient trying to reach something on his bedside table and over-reaching himself.

OBSERVATIONS ON SOME POINTS IN THE MEDICAL REGULATIONS FOR RECRUITING.

By Colonel F. HOWARD.
Army Medical Staff (Retired).

In the September number of this Journal an instructive article, headed "A Plea for the Recruit," was contributed by Lieut.-Col. E. Fairland, R.A.M.C. It dealt with the military aspect of recruiting, but very briefly touched on the professional examination. I propose in this article to offer short observations on some of the points connected with the medical examination of recruits, in the hope that the younger officers of the Corps may thereby be helped in the performance of an important duty.

At present, when there exists more or less difficulty in obtaining recruits of a really good class, and the percentage of rejections runs high, there exists in some quarters an idea that military surgeons are unnecessarily stringent in their examinations, and often reject recruits on what may be termed technical defects or disabilities. This statement may be questioned, but, nevertheless, I think I shall be supported in it by recruiting medical officers. It is more or less difficult to make recruiting staff officers realise that, so long as full responsibility for passing or rejecting recruits rests with the army surgeon, so long must he be left free and unhampered in the performance of his duty. It is the wish to show results of recruiting in *numbers* rather than in *physique* which causes the trouble. "The small and effective army" which the present Adjutant-General prefers has to give place at present to the "large paper force." The first disability I shall deal with is—

Varix.

Varicosity of the veins of the legs and varicocele seem to cause nearly the same ratio of rejections on inspection, the figures for 1901 being for the former 13·98, and for the latter 13·89, per 1,000 men examined. In respect of varicocele the following remarks were made in a report on recruiting by the late Sir Thomas Crawford in the A.M.D. Report for 1862:—

"With a view of determining the extent to which lesions

in the genital organs are disqualifications in a soldier, it may be well to premise that it has been generally held by army surgeons that recruits having any disability which can by any possibility interfere with the free motion of the body or extremities, or which may give colour to the alleged existence of pain, should be rejected. This well-grounded opinion rests on the accumulated experience of the Department, and is supported by the fact that indifferent characters having such disabilities never fail to allege their existence either as an excuse for the non-performance of duty or for the avoidance of punishment. So long as a soldier can demonstrate the existence of a disease in any organ so long will it be impracticable to punish him for malingering to avoid his duty on the one hand, or the penalty of his offences on the other. It is this contingent circumstance, *and not any well-grounded belief in the disqualifying nature of many alleged disabilities, which leads to the rejection of recruits for blemishes which in no way affect the efficiency of a willing soldier.*"

Now, what does the closing sentence of this extract amount to? To my mind, and probably to the minds of other medical officers, it amounts to this, that, in fact, varicocele scarcely at all affects the ability of a soldier to perform all his duties. I may ask, have army medical officers ever had officers or soldiers under treatment for varicocele, or been obliged to excuse them from any duty on that account? In an experience of thirty years' service I never treated an officer or soldier for varicocele, and it would be futile to contend that during that period there did not exist many hundreds who must have had the disability. What I consider should be done in the case of a soldier trying to shirk his duty on this account is, first, for a medical officer to make up his mind whether the soldier is incapable of doing his duty or undergoing a punishment, if he be the subject of varicocele, and if that officer considers he is not incapacitated, to express that view plainly, and by doing so prevent the soldier from evading a duty or a punishment. I fail to see why a little vertebracy on the part of army surgeons should not be shown in a matter which is common knowledge, and yet we continue to reject recruits for varicocele which is found in about one male adult in ten (Gant), and put back scores of candidates for the army for a similar reason, recommending

them for admission "if successfully operated on," losing sight of the fact that in occasional cases atrophy of the testicle has ensued on operation. No such procedure as suggesting operation for disabilities is known in the case of candidates for the navy or other public services. Why then, should, we trouble ourselves about army candidates when any number of lads without varicocele can be obtained? In the navy much greater emphasis is laid on the existence of varicocele as a disqualifying disability than in the army, and, from what I have heard naval surgeons say, their experience as to unfitness for duty on this ground is different to that of army medical officers. I do not pretend to know why this should be.

Then, again, the presence of varicose veins in the leg or legs is only to a certain extent disqualifying, for I have known many cases where they existed to much more than "a modified extent" and yet did not in any way interfere with long marching or walking. I have seen at St. George's Barracks men coming up for the Militia Reserve whom I have rejected for varicose veins in an aggravated form, and such cases have met me with the remark that they had served in South Africa or in garrison regiments with the disability and never been excused a day's duty. All this proves that some relaxation is necessary in rejecting cases for varix, whether of legs or of the genital organs.

In the German army, under the headings of Varix and Varicocele, cases of isolated veins in the leg without the formation of bunches do not incapacitate. Rather pronounced enlargement of the veins (varix) over a great part of the lower limbs incapacitates for the standing army and the Ersatz reserve, and also generally for the Landsturm. In respect of varicocele, a moderate degree of it does not incapacitate for service. Cercocele of such size as to form a pronounced swelling incapacitates for service in the standing army and the Ersatz reserve, but not generally in the Landsturm.

The Ersatz reserve is composed of the supernumeraries not taken for the annual contingent, men excused service for family reasons, men with minor bodily defects, and men temporarily unfit who are likely to become fit at a later date. About 80,000 men are taken annually. Service in it lasts for twelve years, counting from October 1 of the year of com-

mencement of liability to military service. This reserve is intended to fill up the first vacancies in the standing army and its depôts on mobilisation. A certain proportion of the men, fixed annually, are trained. On completion of Ersatz reserve service, men who have been trained pass to the second levy of the Landwehr, the others to the first levy of the Landsturm. The Ersatz reserve, as hitherto understood, has practically ceased to exist, owing to the large annual contingents now taken, and the consequent increase in the numbers of the reserve of the standing army. A certain number of men with physical infirmities will still be trained, however, for duties in the administrative and medical branches, &c.

In the French Army regulations for the medical examination of recruits ("Instruction sur l'Aptitude Physique du Service Militaire") it is stated that slight varices are not incompatible with active service. Varices only entail classification in the auxiliary service, exemption, or invaliding, if they appear with flexuosities and apparent knots, or if the venous dilatations attain at any time a superficial or deep network, or if they occupy the two limbs, or one limb with pronounced varicocele. Varicocele itself entails exemption only if by its considerable bulk it causes a manifest and pronounced uneasiness in marching, and *such cases, it is stated, are exceptional.* In grave conditions it can only give rise to invaliding after abortive appropriate treatment.

Loss or Deficiency of Teeth.

This defect causes a ratio of 26·70 per 1,000 of rejections, and may be put third in order of the causes of rejection. The regulations in our service state that our recruits should possess a sufficient number of sound teeth for efficient mastication. The Committee which fixed the new physical standards (1902) for candidates and recruits was of opinion that, so long as the candidate whose dentition is completed, and who is otherwise eligible, has on each side of the lower jaw two molars which oppose corresponding pairs on the upper jaw and has all his incisors perfect, should not be rejected. In case, however, of those who have not yet cut their third molars it will be sufficient if either the first or second molars oppose their fellows on the opposite jaw, provided the incisors are sound.

In connection with the effect of loss or decay of teeth on the general nutrition of recruits, I am bound to admit from my experience that, in spite of decay of teeth and loss of molars to an extent far beyond the conditions laid down, the general nutrition of the body has been excellent; and yet such cases have been rejected for the army and also for the reserve. I have recently seen soldiers coming up for the Reserve Militia with less than six sound teeth and of superb physique. In the regulations for the German Army it is laid down that deficiency of all the cutting teeth, the eye teeth, and the first back teeth, in one jaw, incapacitate for active service, but permit of service in the Ersatz reserve.

The French regulations say that exemption from service can only be pronounced if mastication is difficult and incomplete through the loss or alteration of a large number of teeth, and if the bad state of the denture is accompanied by softening or ulceration, or a fungous state of the gums; but it is added that "subjects who in spite of the loss of a great number of teeth have the gums in a good state and *whose nutrition is satisfactory* shall be classed in the auxiliary service."

What I desire to plead is that a plain statement is required of the number of deficient or lost teeth, specifying them, which shall cause rejection (*a*) for the active list, and (*b*) for the reserve in *our* army.

The Testicles.

In our service the presence of one testicle only is a cause of rejection, especially if the other be retained in the inguinal canal. It has also been laid down by the Committee on Physical Standards that, if the other testicle be retained in the abdomen, the case should be regarded with suspicion, but "in itself such retention need not disqualify" a candidate otherwise eligible. Why, then, is the recruit who has only one testicle and the other not apparent to be rejected? The possibility of the retained testicle, if it be in the abdomen, becoming liable to disease is remote; disease *may* occur, but is it within even the bounds of probability? The German regulations say, retention of one or both testicles in the abdomen does not incapacitate for service. Loss or atrophy of both testicles without any essential disturbance of the general health

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incapacitates for service in the standing army and the Ersatz reserve, but not generally in the Landsturm. In the French army it is laid down that the loss of two testicles subsequent to an operation or accident, absence or pronounced atrophy of these two organs, entails exemption and invaliding, but that the loss or atrophy of one testicle, the other remaining sound, *is compatible with military service.* The medical staff of the London recruiting district are in favour of accepting a recruit with one testicle provided the other be not retained and felt in the inguinal canal, but a recent decision of the Medical Department, War Office, prohibits such cases being enlisted.

The next disqualification I shall take up, and one on which much diversity of opinion exists, is

Flat Feet or Flat Foot.

This causes a rejection ratio of about 11·66 per 1,000 of men examined. I cannot do better than quote from Sir T. Crawford's paper on Recruiting in the A.M.D. Blue Book for 1862. He says: "The conditions which constitute a disqualification under this head, and the anatomical peculiarities of flat and broad feet, are clearly and concisely stated by Director-General Gorcke, of the Prussian Medical Service, in the following, quoted from Mr. Marshall's excellent treatise on Recruiting:—

"'In the flat foot the bones of the leg are for the most part natural: there is, however, an irregularity in the manner in which the bones are placed on the foot, and the relative position of their distant extremities with respect to the bones of the tarsus. The inner ankle is very prominent and is placed lower than usual. A hollow exists below the outer ankle of greater or less extent, according to the degree of the deformity. The dorsum, or back of the foot, is not sufficiently arched; the foot is broader in the neighbourhood of the ankle than near to the toes; the inner side of the foot, which, in a well-formed person is concave, is flat and sometimes convex. When a flat foot is placed on the ground, the sole projects so much on the inside that the finger cannot be introduced below it. A person with flat feet usually walks with his knees bent, and assumes an attitude like a man when he pushes forward a wheelbarrow. He rests on the inner side of the sole, and the

usual degree of motion of the ankle-joint is impeded. By a very moderate degree of attention a flat foot may easily be distinguished from a broad foot. In the broad foot the bones of the leg are well placed upon the foot, the usual hollow exists under the inner portion of the sole; the back of the foot is arched, the foot is not disproportionately broad at the tarsus; the expansion of the foot commences with the bones of the metatarsus and it is broadest near to the toes.'" Flat feet as above defined, says Sir T. Crawford, are a disqualification; broad feet, on the contrary, usually indicate that their possessor is inured to walking and consequently that he is well adapted for military service. Overcrowding of toes, or the existence of bunions, or ganglions, or extensive callosities on the soles of the feet, are stated to be causes of rejection, and are no doubt properly so considered when they exist to any great degree; but, as they are generally the result of ill-fitting boots, there is a fair probability that they will, when not of long standing or great extent, prove of little consequence. Overlapping or supernumerary toes is a disqualification in a recruit. It will thus be seen that, unless the typical flat foot be well apprehended, many men with but an indifferent arch are likely to be rejected. Indeed, such cases when rightly and properly enlisted by a recruiting medical officer have been subsequently rejected by a Medical Board through a misapprehension of the conditions which constitute flat feet. Numberless cases of indifferent arches to the feet are examined, and were these excluded from serving the percentage of rejections would be very high. Cases of broad feet with indifferent arches have marched thousands of miles during the South African war and are passed largely into the reserve. It is time all army surgeons should recognise these facts. In the regulations for the German army flat foot is not described, but is divided into "perfect" and "imperfect." The former incapacitates for service in the standing army and the Ersatz reserve," but not generally in the Landsturm. Imperfect flat foot does *not* incapacitate for service.

The regulations for the French army say that flat foot (*pied plat*) in a pronounced form with exaggerated projection of the astragalus and scaphoid below the internal malleolus and projection of the axis of the limb within the axis of the foot

can alone render unfitness for military service. The simple effacement of the arch (*voûte*) is not a cause of incapacity to serve. A hollow foot ought only to entail exemption and invaliding when it is very pronounced and necessitates a special shoe or boot.

I desire to close this paper by offering a suggestion that the medical standard for the regulars and militia might be largely relaxed for the Militia Reserve and garrison regiments. The application of the same standard to both is assuredly losing us many desirable men for the latter. What support my suggestion may receive from my brother officers, I dare not forecast.

ADDRESS BY SIR WILLIAM TAYLOR, K.C.B., K.H.P., TO THE LIEUTENANTS ON PROBATION OF THE ROYAL ARMY MEDICAL CORPS,

AT THE OPENING OF THE 88TH SESSION OF THE ROYAL ARMY MEDICAL COLLEGE.

GENTLEMEN,—It is a great pleasure to me to welcome you here to-day, on the threshold of your life as Army Medical Officers. My welcome is sincere and honest, for I feel assured that, in the selection you have made of a career, you have chosen wisely.

It is fitting, too, that your career in the Army should begin in this College, for here, I believe, you will find that, though qualified to practise medicine, your education is not yet complete, but you have yet to be instructed in certain special branches of professional knowledge with a view to your being the better equipped for your military medical career, and which you might never have found it necessary to take up had you remained in civil life. Though you are now, each one of you, legally qualified to practise your profession in civil life—are fully equipped for such practice—there are still subjects you must master before you can be considered, or can consider yourselves, able to take up the varied and multifarious responsibilities of an officer of the Royal Army Medical Corps.

You are further to be congratulated on the fact that you are now enabled to study these other subjects here, in London, one of the greatest centres of instruction in matters bearing on Medicine, Surgery, and Hygiene.

The recommendations of Mr. Brodrick's Reorganisation Committee, through the labours of the officers of the headquarters of the Army Medical Service and of the Advisory Board have been brought to a successful issue. You should know that a special Sub-Committee of the Reorganisation Committee dealt, in a somewhat exhaustive manner, with the details of a College scheme; and further experience of the methods which have been in operation for the early and advanced courses of study for Army Medical Officers has enabled the Advisory Board to put forward proposals of a comprehensive nature.

The course of post-commission study, now happily provided for and established, renders the establishment of a military-medical teaching institution in the metropolis essential, and the location of the College in London entails the attendance of junior officers there.

It is unnecessary to enter fully into a consideration of all the conditions which the College is designed to meet, but it appears plain that the effects upon the efficiency of the medical services of the country should be valuable. It goes without saying that the closer the union between the civil and military members of the medical profession (and in the latter I include the auxiliary medical services), the better for the State and for the Royal Army Medical Corps. For it is not the least of the objects sought to be gained by the College that it should become a centre towards which, for Imperial purposes, the medical profession at home and in the colonies, the Regular and Auxiliary Military Medical Services, should converge. It is not now a question as to how far the Royal Army Medical Corps is alone prepared to undertake the responsible duties which devolve upon its officers in time of war. If the military efficiency of the country is held to depend largely upon the military education and training of the civil population, it is assuredly true that the medical profession is equally deeply concerned with military medical problems. While, therefore, the primary object of the foundation of this College is to provide for the more efficient training, elementary and advanced, of the military medical officer, it will be possible to adapt the school to the requirements of the profession generally, and of the auxiliary forces, by means of lectures, exhibits, &c.; in other words, by the formation of a military medical institute. This College, then, should have far-reaching results, beneficial alike to the civil and military medical professions.

Time will not permit me to give a complete history of Army Medical Education. The earliest official recognition of specialised study for military medical officers on any important scale is associated with the revered name of Lord Herbert of Lea, who instituted the Army Medical School in connection with the Royal Victoria Hospital at Netley.

The records of the Senate of the Army Medical School at Fort Pitt, Chatham, show unquestionably that the contemplated

removal of the school so far from London as Southampton, was received with regret. The professors and the Senate appear to have recognised the difficulties, inconveniences, and hindrances likely to arise from a position of isolation, and favoured the alternative proposal of setting up the school in connection with the then recently established Herbert Hospital at Woolwich. In support of this they urged "its proximity to London and the offices of Army administration, particularly that of the head of the department, of the great hospitals, medical schools, and learned societies, and the facilities its nearness to these great fountains of medical knowledge afford for profitable intercourse, as well as for receiving visits of professional foreigners of distinction, who have already evinced a desire to reciprocate benefits to profit by what the professors have to show and to aid them in return." We may be certain that Professor Parkes, who signed a document in which these words occur, exerted a potent influence in the expression of views which have now been independently adopted by the Secretary of State. Since the days of Lord Herbert, the organisation of the medical department of the Army has undergone remarkable changes. It may be maintained that the efforts of its officers have been mainly directed to improvement in the military position; but it should always be remembered that the principle of autonomy has been a fundamental one in the minds of those who have been responsible for the direction of events. It is quite clear that Mr. Sidney Herbert was impressed with the importance of the development of the military medical service in both the military and professional senses. It is, at any rate, certain that when the history of the Medical Corps comes to be written it will be abundantly clear that at least one of the professional advisers of the Secretary of State of the day held views regarding administration in war which must have profoundly impressed that statesman. Some of the letters of Mr. (afterwards Sir Thomas) Longmore, written from the Crimea, clearly indicate the position which powerfully influenced all the subsequent events. The enthusiasm which, under the influence of Parkes, Longmore, and Maclean, became the predominant feature of the early years of the school of Sidney Herbert, cannot be said to have been extinguished in the struggle for autonomy which followed.

But it was hidden. Meanwhile, the influence of the professors was enormous. Charged with the success of the first attempt at education in Hygiene and Tropical Medicine ever made in this country, their disciples imbibed something of their spirit. The school came subsequently to be described by American Army surgeons as "the Mecca to which the thoughts of Army surgeons all over the world were directed."

That we may clearly understand the gradual development of the importance of preventive medicine—hygiene—in the Army, let us go back to a much earlier period than that of the Crimean War.

Sir James McGrigor, shortly after his appointment as Director-General of the Army Medical Department in 1814, organised a system of returns and reports, which may be regarded as the foundation of the first systematic attempt to control the sickness and mortality prevailing in the Army. In 1835, Mr. H. Marshall, Deputy Inspector-General of Hospitals, and Lieut. Tulloch, 46th Regiment (afterwards Major-Gen. Sir A. M. Tulloch, K.C.B.), were associated in preparing a report on the sickness and mortality of the troops serving in the West Indies. In the following year, Dr. T. Graham Balfour, M.D., F.R.S., replaced Mr. Marshall, and the inquiry was extended to other colonies. The reports prepared by these officers were published in four volumes, and to these reports may be given the credit of first seriously attracting the attention of the military authorities to the fact that many of the agencies which exercised an adverse effect on the health of the soldier were under control and could be removed or ameliorated. In 1848 a second series of reports was prepared by the same officers, embracing a further period of ten years. As the result of the Crimean War, a Royal Commission was appointed in 1857 to inquire into the regulations affecting the sanitary condition of the Army, of which commission the Right Honourable Sidney Herbert was President, and Dr. Graham Balfour Secretary, and two of the practical outcomes of the Commission were the establishment of the Army Medical School and of the Statistical Branch of the Army Medical Department.

Since then the subject of preventive medicine has always occupied a foremost position in schemes of military medical education, and in this regard it is of interest to note that

the Herbert Commission gave expression to the following views: "The medical officer should, therefore, not only be thoroughly conversant with sanitary science, but with the mode of its application to the preservation of health under every possible variety of circumstances and character." It may be fairly claimed that the foundation of the Army Medical School was the very beginning of systematic teaching of sanitary science in this country. The Army Medical School may well be proud of the world-wide fame which its first professor of Military Hygiene earned for himself. Among the many reputations as hygienists which have since been earned there is no name so illustrious as that of Professor Parkes. The history of sanitation in England is the history of Army sanitation, and Parkes has justly been called the "Father of Hygiene." To him belongs the credit of having laid the foundation of that rapid advancement of the knowledge of the laws of health which has placed this country in the forefront of the nations of the world as regards sanitary progress. Parkes' "Practical Hygiene" for years remained the standard text-book, and while, to keep progress with the times, it has had to be added to and to a large extent rewritten, the book, though no longer bearing the well-known name, is still one of the leading treatises on the subject. Apart from its influence upon the spread of sanitary knowledge throughout the world, the teaching of Parkes bore excellent fruit among the many Army medical officers who had the great privilege of being his students, and it has in that way contributed in an immeasurable degree to the enormous improvement which has taken place in the sanitary surroundings of the soldier since the days of the Crimean war.

Professor Parkes was succeeded in the Chair of Military Hygiene by the late Surg.-Major F. S. F. de Chaumont, F.R.S., a man who also did much to advance the progress of sanitary knowledge. Professor de Chaumont was a leading authority on hygiene, and perhaps his best known original work is that connected with the ventilation of barracks, and his dietetic researches. He was a man of wide culture, a capable linguist, and an able mathematician. He edited several editions of Parkes' classical work, and was the author of many papers on sanitary and scientific subjects.

The next incumbent of the Chair was Colonel Lane Notter,

also well known in the world of hygiene, and a frequent contributor to the literature of his special subject. The present Professor of Military Hygiene, Lieut.-Col. R. H. Firth, has already made a name for himself in sanitary science. He has written much and well on sanitary and medical subjects. His best recent original researches have been a study of the pathology of dysentery, and an inquiry into the influence of soil, fabrics and flies in the dissemination of enteric infection, a valuable piece of work done in association with Major Horrocks, who was at the time assistant Professor of Military Hygiene. Major Horrocks is also well known as an authority on the bacteriological examination of water, and is the author of the most complete monograph on that subject which has as yet appeared. In Lieut.-Col. A. M. Davies we have another able authority on hygienic questions. He was Assistant Professor in the Army Medical School in Professor de Chaumont's time, and for a year discharged the duties of professor. Afterwards, as Sanitary Adviser at Army headquarters in India, he did most excellent service in furtherance of sanitary progress in that country. Improved sanitary conditions in many Indian cantonments have resulted from his labours, but perhaps his best work in India was in connection with the provision of pure water supplies to many stations. He is the author of a most excellent book on hygiene, and he now holds the appointment of sanitary expert on the Advisory Board at headquarters.

Amongst men who have had no connection with the teaching staff of the school, but who have taken a leading share in the advancement of military hygiene, many names might be mentioned; Massy, Home, Marston, Ker Innes, Welch and Martin are perhaps the best known. Of the recent men Macpherson, keen, enthusiastic and thorough, should receive special notice. He was sent on special duty to South Africa to report and advise on sanitary matters connected with the South African garrisons.

Since the institution of the medical school every medical officer entering the Army Medical Service has had a careful training in hygiene to fit him to deal with the numerous sanitary questions which he is sure to encounter in the performance of his ordinary duties, and that under very varying conditions.

Prevention of disease is a most important part of his daily work—I had almost said the most important part. The result is that a very large amount of quiet unostentatious sanitary work is being done by Army medical officers in all parts of the world, and there can be no doubt that the greater part of the amelioration in health conditions, in stations which were formerly unhealthy; and the improvements which have resulted in connection with the housing, clothing and feeding of soldiers, and the removal of causes of preventable diseases, have been due to well-directed efforts, born of the knowledge imparted to every officer of the Service during his course at the Army Medical School. The good work which has been done has well sustained the great reputation of the school, and that is the best augury for the future. With well-equipped laboratories in the new Royal Army Medical College we need never fear that we are likely to be outstripped in the race of progress, and we look forward confidently to the Army Medical Officer being kept abreast of the times, nay, leading them as far as sanitary knowledge is concerned.

I have learnt to look upon a low sick rate as the sign that the officer in medical charge of the troops has been doing his duty to them and to the State; that he has been spending his time with intelligent observation in the lines, that he has been seeing to the soldiers' surroundings, has been interesting himself in their personal habits, and so by tact and sympathy gaining the confidence of the men, the sure, the only way of acquiring that influence with them which will enable him to give advice which will be listened to and acted upon.

You will sometimes hear it said that the Army doctor has little to do. Let not that disturb you; You will find from experience that it is otherwise. Work on unceasingly, work earnestly with might and main at prevention, which is better than cure; strive unremittingly to teach every soldier under your care how to avoid the little ailments of daily life, as well as how to safeguard himself, as far as it is possible to do so, against those more serious and more dangerous diseases to which he is specially exposed. It is also said that his practical experience is confined to treating the diseases of early manhood, and that this limitation of practice leads to stagnation of effort, and to blunting of mental acuteness and judgment. Believe me, there is nothing

further from the truth. No Army medical officer need let his knowledge rust; his opportunities for keeping himself abreast of the knowledge of the times are as good, and I think even better, than those of the doctor in civil practice. There is abundance and variety of clinical work to be found in our Army hospitals. The field of the army surgeon is world-wide, and in the domain of tropical medicine he will find a field for observation and research that affords opportunities for practice and progress that no other section of our profession possesses.

Results not less important than those which have resulted from the teaching of hygiene have followed the pathological teaching at Netley. Consider the history of that interesting and most important disease, Malta or Mediterranean fever, interesting and important from a military and naval, as well as a civil, point of view.

The true nature of this fever was unknown until the year 1886. Up to that time it was thought by some to be enteric fever, by others to be remittent fever, and by others still to be a combination of these two fevers, and called by them typho-malarial.

In September, 1887, one of our officers—now Col. Bruce, F.R.S.,—wrote a paper announcing his discovery of the *Micrococcus Melitensis*, showing that this bacterium is the specific cause of the disease, and he separated Malta fever definitely from enteric and malarial fevers.

The next point in its history was to overcome the difficulty of diagnosing the disease during life. That difficulty was overcome by Professor A. E. Wright and his assistants in the Army Medical School, who discovered the blood test for the fever.

The incubation period was also made out there, once by Professor Wright, who knowingly inoculated himself, and on other occasions through the accidental inoculation of other members of the staff.

Our knowledge of its geographical distribution was much extended by officers of the Royal Army Medical Corps, and here I may quote from a paper by the late Professor of Pathology in the Army Medical School.

"By the application of the blood test to patients invalided from abroad, it was determined that Malta fever existed in

certain stations in Northern India. These results were confirmed and extended by other observers abroad and in India, with the result that the disease is now known to occur all over the Mediterranean basin, in Northern, Central, and Southern India, and in Hong Kong and South Africa.

"Quite recently the medical officers of the American Army have described the occurrence of the disease in Puerto Rico, in the Philippines, and in certain other of the Pacific Islands."

There is still much to be done in the elucidation of this fever, and we are looking anxiously to our officers stationed at Gibraltar and Malta to tell us how the disease is conveyed from the sick to the healthy; whether by water, food, inhalation, inoculation, or by means of an insect-carrier; how the micrococcus leaves the body, how it behaves outside the body, and many other points of great interest and utility in framing measures of prevention.

It would appear then that officers of the Royal Army Medical Corps have done their share in the investigation of this disease, and in this alone the establishment of this school appears to be justified.

Let us now turn to another most important army disease—enteric fever. The principal work done in the Army Medical School during the past few years in relation to this disease has been the attempt to modify its ravages by anti-typhoid inoculation. The prevention of enteric is one of the most momentous questions of the day in Army sanitation. War would lose half its terrors if this disease could be kept within bounds. We know what an immense amount of work has been done by Royal Army Medical Corps officers under the guidance of Professor Wright, and, if the results are still under discussion, many are of opinion that it is on the lines pointed out by him that final success will be attained. For the careful consideration of the subject, a Sub-Committee of the Advisory Board has been formed, and Lieut. Smallman, R.A.M.C., is devoting himself to experimental research on this subject at the Lister Institute.

Time will not permit me to take up the closely allied disease, dysentery; but much of the recent work on this disease has been done by our officers, among whom I may mention Birt, Bruce, Firth, and Horrocks.

Leaving the bacterial diseases, the history of a disease which is much in evidence at present, trypanosomiasis, is of interest in connection with this subject.

This branch of tropical medicine has its origin in the discovery by Surg.-Major T. Lewis, F.R.S., of a flagellate in the blood of rats, which was afterwards named *Trypanosoma Lewisi*. That officer, trained at Netley, was one of the best types of scientific men. At the time of his death it was written of him that "he was gradually becoming a very centre of scientific influence, and a source of inspiration for earnest work as a teacher and of genuine research in the Army Medical School in his position as Assistant Professor of Pathology. He was indeed one of those men "who go on working for Truth's sake," and he imbued the minds of those he taught with the same keen love of work. The life-history of such a man and the work he did is worthy of more than a passing notice for the example it teaches, as pursuing a lofty ideal. He died at the early age of 44, almost before the scientific medical world knew what it possessed in his life.

> Sunk like an Argosy scarce left the shore;
> And the boundless depths of ocean hold
> Pearl, and diamond and gleaming gold,
> Lost to the use of man for evermore.

The next step in the trypanosome problem was made by Evans, who found similar flagellate organisms in the blood of horses suffering from surra.

The third step was the discovery, also made by one of our officers, Col. Bruce, that tsetse-fly disease was due to the presence in the blood of a trypanosoma, and that the fly merely acted as a carrier of the parasite from the affected to the healthy animals.

And, finally, the last addition to our knowledge of this class of diseases has been again made by the same R.A.M.C. officer, who within the last few months has discovered that the sleeping sickness of Western and Central Africa is nothing more or less than a human tsetse-fly disease.

In another great group of diseases, namely, filariasis, the pioneer work was again done by Surg.-Major Lewis, who discovered and described the *Filaria sanguinis hominis*, from which discovery most of our work on this group of diseases has dated,

and there can be no doubt that his papers are the most masterly disquisitions on the subject of filariasis that have appeared in this or any other language.

To come to the present day, one of the most interesting discoveries of recent times in the etiology of human disease was made a few months ago by your Professor of Pathology, Major Leishman. As the result of the examination of microscopical preparations of a spleen, from a case of what has been known locally as Dum-Dum fever, he came to the conclusion that the disease was not malaria, but was caused by another kind of protozoal parasite. When we think of the difficulty of differentiating the various appearances seen in the splenic pulp, we must heartily congratulate Major Leishman on the keen observation and acumen which enabled him to detect these infinitely minute bodies. He wrote an excellent paper, describing what are now known as Leishman's bodies, and this has led to work being done on the subject by Donovan, Laveran, and Ross, which goes to show that the discovery is a notable one. The generic name Leishmania has been proposed for the parasite, and Major Leishman has every reason to feel satisfied in having done such a fine bit of observation.

To recapitulate the work done by medical officers trained in this School would almost be to write the history of tropical medicine, and so I will close this cursory account of their attainments by mentioning to you the name of Major Ronald Ross, F.R.S., the discoverer of the etiology of malaria, who received his training in hygiene and pathology in our School.

Gentlemen, the Army Medical Service has every reason to be proud of the work done by such of its officers as those I have named, and it holds them in honour, not only for the work they have done, but also for the bright example they have given and are still giving to all who would do well.

If the record of the Army Medical Officer in the domains of general medicine and surgery are not so brilliant, it is partly because the isolation of the School hitherto from the great civil schools rendered any plan of advanced teaching in these subjects impossible, but perhaps more because he had no channel through which to let his work be known. It is now recognised that the closest connection between the leading institutions and the College must be maintained to ensure effective education.

We in the Army have held that this connection will have effects upon the medical profession of Imperial importance, and we cannot doubt that far-reaching consequences will follow that long-desired combination of the civil and military medical professions, not only for teaching purposes, but for the serious study of the adaptation of the science and art of medicine to the science and art of war.

Just one word more. It may seem disheartening to you who have just finished your course of study and qualified, that you should have to begin your career in the Army by going to school again. Gentlemen, we all, each and everyone of us, remain at school every day of our lives, either as diligent and attentive learners, or as idlers, not listening; the demonstrations and experiments continue to be made before our eyes if we are intelligent and attentive enough to see them. Life to those of us who would do well, who would succeed, and who would leave "behind us footprints in the sands of time," means work, constant work, for our own happiness and for the general good.

> Know'st thou yesterday, its aim and reason ?
>   Work'st thou well to-day for worthy things ?
> Then calmly wait to-morrow's hidden season
>   And fear not thou what hap so e'er it brings.

Believe me, Gentlemen, you will find the greatest happiness in constant, earnest work for the benefit of your fellow-men, and will sooner or later realise—

> That he is bravest, happiest, best,
>   Who from the task within his span
> Earns for himself his evening rest,
>   And an increase of good for man.

THE ROYAL ARMY MEDICAL COLLEGE.

By The COMMANDANT.

The preliminaries to the commencement of this establishment have now reached their final stage, and (as set forth by the Director-General in his address at the outset of the first session of 1904 of the College, to be found elsewhere in this number), we hope soon to see the permanent Laboratories, Mess, and Quarters, coming into being.

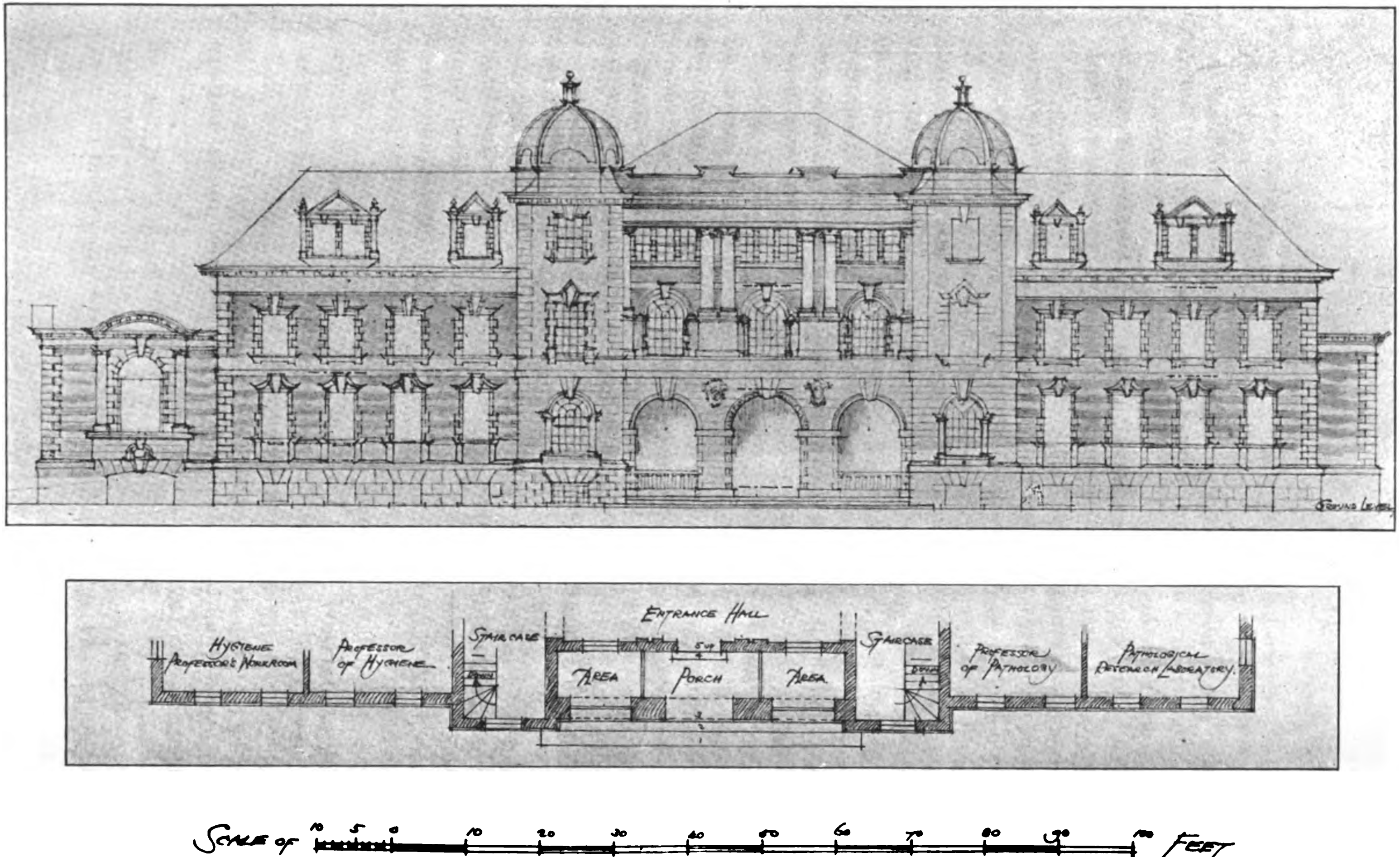
It is needless here to insist on the necessity for the presence of the teaching headquarters of the Army Medical Service in the centre of all progress and enlightenment—the Metropolis; it is enough that the policy of Mr. Brodrick as Secretary of State for War, inspired, as is also his successor, by a true interest in the efficiency of the Army Medical Service, has, with the help and concurrence of such men as Sir Edward Ward, been adopted, consonantly with the advice of those best qualified to judge of the wisdom of the step, both in the military and civil medical profession. This has been the feeling, not only of men of the present time, but of times past, who deplored the removal of the then embryonic teaching centre from Fort Pitt, at Chatham, to Netley, urging the distance of that place from the medical schools and hospitals as militating against the education of the medical officers who desired to keep abreast of modern knowledge.

The stage of discussion has now been left behind, and that of realisation begun.

The buildings, of which only the plans and elevation of the laboratories are given in this number of the Journal, comprise a laboratory block, a Mess and Officers' Quarters, and the Commandant's house.

They will be erected on a site* on the left bank of the Thames which runs north and south in this reach, on the eastern half of a space formerly comprised in the site of Millbank Prison, to the south of the Tate Gallery, which occupies the central oblong of the octagon formerly covered by that prison.

* It is hoped that plans of the Mess and Officers' Quarters and Commandant's House will be ready for insertion in the March No. of the Journal.



THE ROYAL ARMY MEDICAL COLLEGE, LONDON. LABORATORY BUILDING.

The western half of this space is occupied by the Army Service Corps Barracks, and the corresponding space, on the north side of the Tate Gallery, is occupied by the new Station Hospital for London, which will afford material for clinical study, and which will work with the College.

The river will be commanded by the Mess building, especially to the north, and the site is one which will be in consonance with the very handsome College buildings and the Tate Gallery.

The buildings will be of red brick and stone, and the style of architecture in keeping with that of the other buildings on the site. The architects are Messrs. Woodd & Ainslie.

A detailed description of the buildings would take too much space, and an enumeration of the main features must suffice, taken with the plans. The two blocks (laboratory and mess) cover a more or less triangular space of about 300 by 200 feet. The laboratory block is on the part of the site furthest from the river. It measures 185 feet by 105, and is quadrilateral in plan. It comprises a basement, ground floor, first and second floors.

In the basement are furnace and boiler-room for the heating of the buildings. A covered yard for experiments in small projectiles. A room for hygiene experimental apparatus; workshops; cloakroom lockers, and cycle stable for the officers; a micro-photographic room; rooms for distillation, for disinfection, and for sterilisation; store-rooms.

On the ground floor, which has a central portion and two wings: A lecture theatre to seat 200, placed centrally; an entrance hall; hygiene and pathology class-rooms of 80 by 50 feet each, with their annexes; laboratories connected with each department.

On the first floor, through whose height the theatre and class-rooms rise, are: A library and reading room, 30 by 60 feet; pathological research rooms, and lavatories.

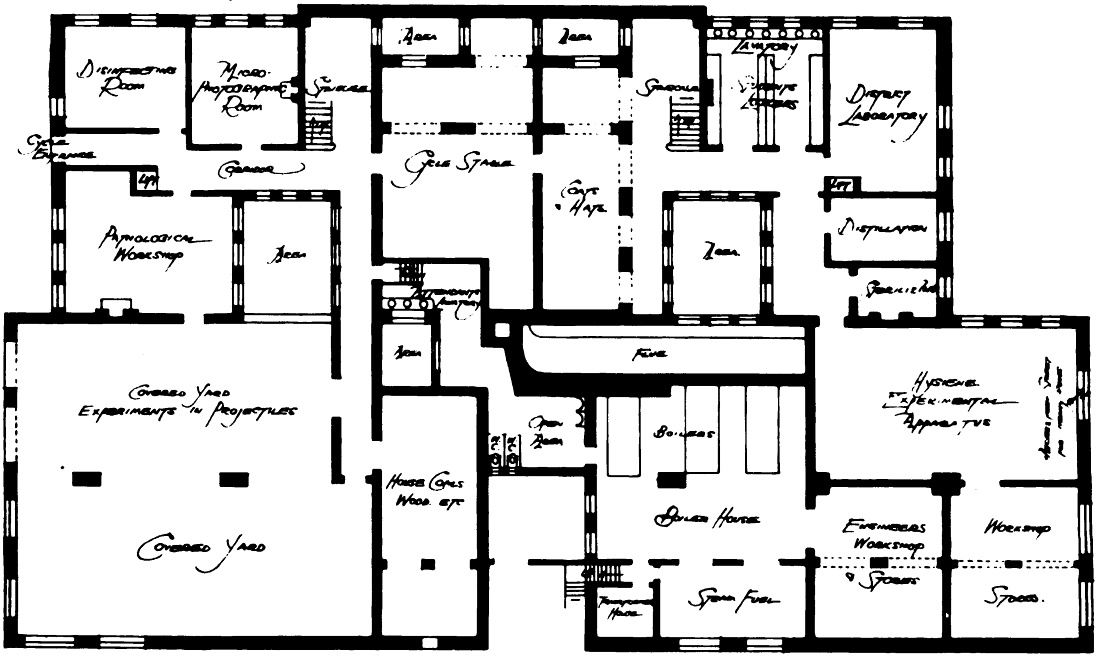
On the second floor: A museum and a model room, each of 40 by 25 feet, and with top lighting. There are rooms also for storage of glass, for teaching operative surgery, &c.

This building is seen in west elevation.

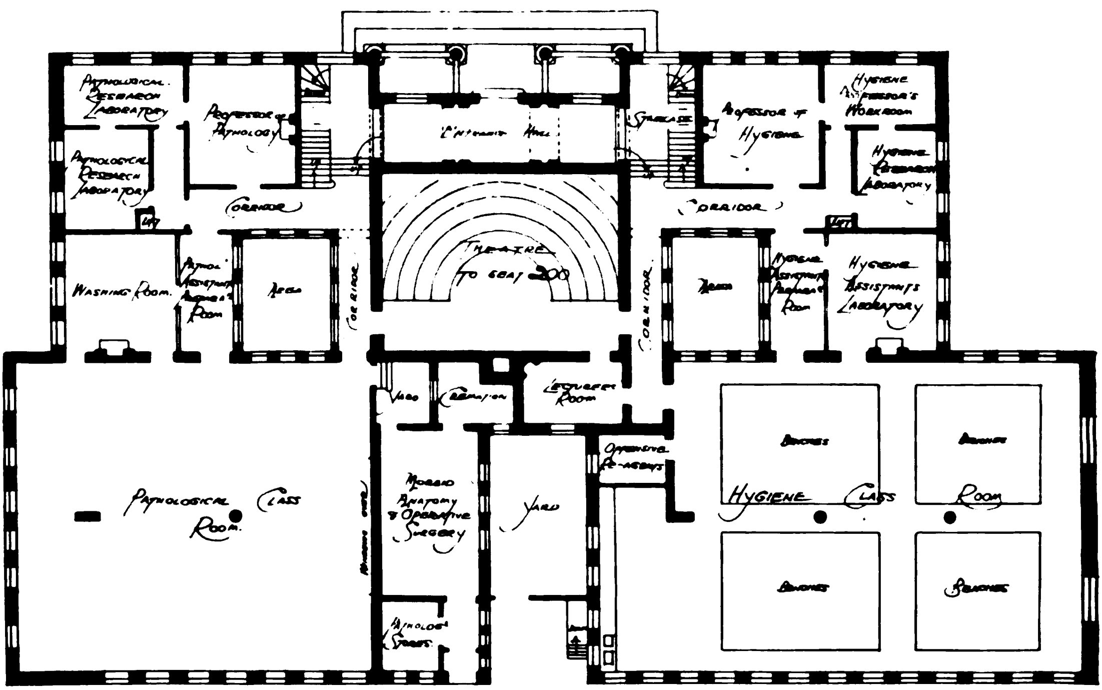
A squash-ball racquet court will be constructed on its southern aspect.

The entrance to the officers' mess is from the river side, on the east, and the back and tradesmen's entrance on the north side; a passage interposed between the laboratories and the mess,

ROYAL ARMY MEDICAL COLLEGE—PLANS OF LABORATORY BLOCK.

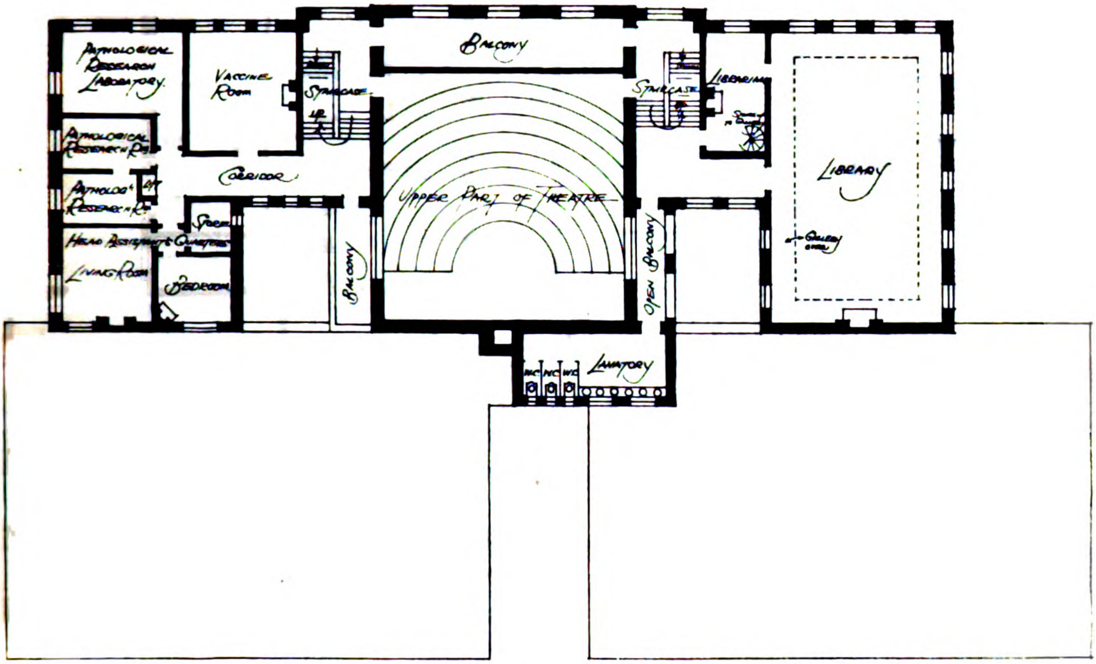


Basement Plan

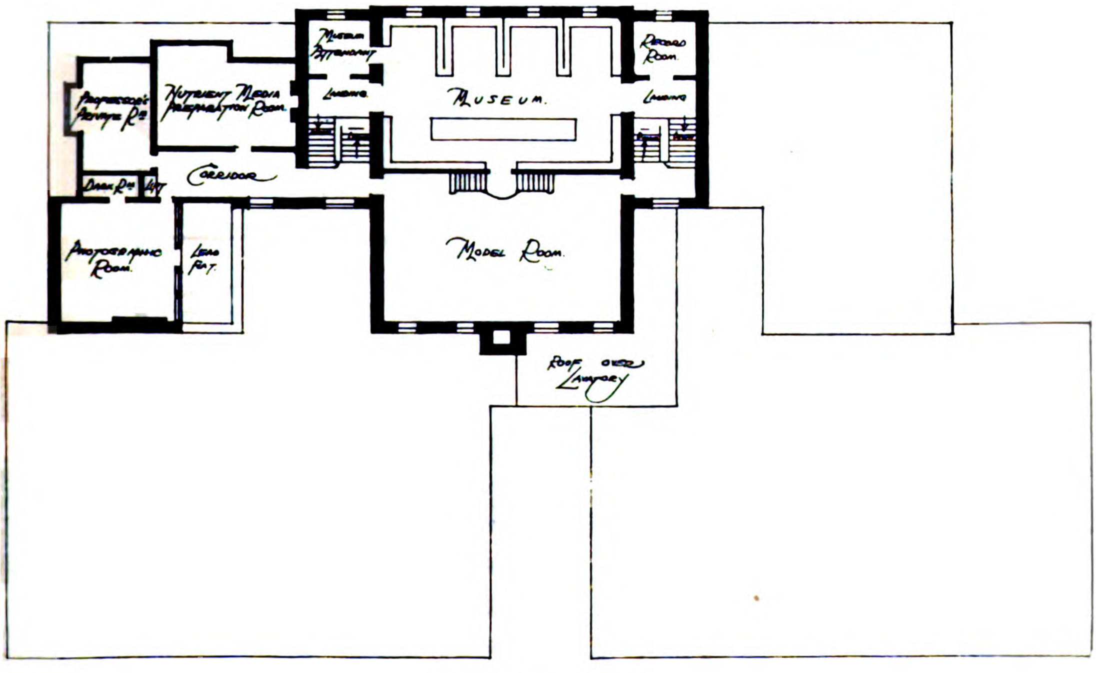


Ground Floor Plan.

ROYAL ARMY MEDICAL COLLEGE—PLANS OF LABORATORY BLOCK.



First Floor Plan.



Second Floor Plan.

Scale of 10 5 0 10 20 30 40 50 60 70 80 90 100 Feet.

giving access to the two divisions. The laboratory accommodation will be of the first order, and the whole conception is one which reflects credit on its authors, and its realisation should go far towards promoting the object for which it was designed, namely, the education of the Army Medical Officer. It is to be hoped that every officer, on returning from a foreign tour, will find his sojourning place there, for the purpose of refreshing his knowledge, and that Army Medical Officers of Foreign Powers will find that they have something to learn from our Medical Service.

A description of the Mess and Quarters is reserved for a later issue.

It is within the bounds of possibility that the laboratories may be ready for occupation in eighteen months' time.

Editorial.

DUM-DUM FEVER.

We print in another part of this number of the Journal a translation of part of a paper by Messrs. Laveran and Mesnil, entitled, "On a New Protozoon, the Parasite of an Indian Fever." As this fever marks one of the most interesting pathological discoveries of the time, it will be well to briefly go over its history.

In April, 1900, Pte. J. B., 2nd Royal Irish Rifles, was admitted to the Royal Victoria Hospital, Netley, from Dum-Dum, suffering from chronic dysentery, cachexia, and irregular fever, and died some seven months later. During this time his blood was frequently examined by Major W. B. Leishman, R.A.M.C., at that time Assist. Professor of Pathology in the Army Medical School. After death, smear preparations were made of the spleen pulp, and Leishman was struck by the curious appearance, among the spleen cells and red corpuscles, of enormous numbers of small round or oval bodies, 2 to 3 μ in diameter, which corresponded to nothing he had previously met with or had seen figured or described. These bodies were clearly parasitic in origin, and the question arose as to what was their nature.

Sometime before this Leishman had been working with Nagana or tsetse-fly disease, which is caused by a trypanosoma, and came upon appearances in the blood and internal organs of a white rat which seemed to solve the question. In this rat, dead of nagana, there were bodies seen practically identical with the bodies seen in the case of Pte. J. B. Leishman, therefore, put forward the hypothesis that Dum-Dum fever was a form of trypanosomiasis, and these bodies found in the spleen were the remains of the macronuclei and micronuclei of trypanosomes. He further suggested that cases of Dum-Dum fever and Kala-Azar should be carefully examined for trypanosomes, microscopically, by centrifuging a quantity of blood, or by inoculation into monkeys. This paper of Leishman's was published in the *British Medical Journal*, May 30, 1903, some three

years after his observation of the case. This paper brought out a letter on July 11, 1903, from Capt. Donovan, I.M.S., also published in the *British Medical Journal*, in which he stated that he had also noted these bodies in smear preparations taken from three cases of natives, who were thought to have died of chronic malaria. Donovan thought at the time that these bodies were probably *post-mortem* degenerations of the nuclei of the splenic pulp cells. On reading Leishman's paper he recognised that the bodies described by him were the same as those seen in the spleens of the three natives.

On June 17, 1903, Donovan had occasion to puncture *intra vitam* the spleen of a native boy, and found identical bodies in the pulp and blood, thus removing any doubt there was as to these bodies being due to *post-mortem* changes. There was nothing resembling trypanosomes in the peripheral blood of the boy.

It appears that at this stage Donovan sent smear preparations to Major Ronald Ross, late I.M.S., in Liverpool, and to Dr. Laveran in Paris.

From an examination of these specimens, Dr. Laveran concluded that the bodies described by Leishman belonged to the genus *Piroplasma*, and not to *Trypanosoma*, and proposed for them the name *Piroplasma Donovani*. We are sure if Dr. Laveran had fully understood the work done by Leishman, who undoubtedly has the priority in this discovery, he would have done our colleague the honour of naming this parasite after him instead of after Donovan.

At the same time, and independently, Ross also published papers in the *British Medical Journal* (Nov. 14 and 28, 1903) on this subject. He did not agree with either Leishman or Laveran, but thought these bodies probably belong to a new species of sporozoa, and proposed Leishmania as the new generic name.

From Laveran and Mesnil's paper, and especially from the figure given, Leishman's bodies do show a marked likeness to the piroplasmata. It is plain we must wait for further evidence, and it is to be hoped that our officers will lose no opportunity of adding to our knowledge on this interesting disease.

Diseases of the domestic animals caused by the piroplas-

mata are common over all the world. Such is Texas fever in America, S. Africa, Australia, &c., caused by *Piroplasma bigeminum;* a disease in horses in S. Africa, described by Theiler as horse malaria, and caused by *P. equi*; another in the dog, which also occurs in S. Africa, and which was found lately as far north as Uganda, is caused by *P. canis,* and gives rise to the disease known as malignant jaundice in the dog.

One most interesting point in regard to these piroplasmata is that they are conveyed from the affected animals to the healthy, as a rule, by means of ticks, and that it is the progeny of the tick that has this infective power. If Dum-Dum fever is proved to be caused by a piroplasma, the insect-carrier should be looked for, and it is the ticks which should be viewed with most suspicion.

Echoes from the Past.

AN OLD TIME ARMY SURGEON.

By Lieut. J. A. BALCK.

It is rarely an unprofitable task to delve in the records of the past, whether of a nation or of some smaller polity. To present to ourselves the conditions under which our forefathers and predecessors lived must always be a matter of interest. And if, as in the case of our Corps, the centuries show a steady progress we shall appreciate all the more what we have attained, by comparing with it the difficulties under which they laboured, and yet did good work.

It has been my fortune to come across a book which presents a vivid picture of the life of the Army Surgeon of the eighteenth century. A certain Dr. Hamilton has laid down in his "Duties of a Regimental Surgeon" a record of his life in the service, and his thoughts on the same. Judging from his book he can have been a man of no mean attainments, and I have no hesitation in drawing on him for my facts.

I can give no better introduction to the subject than what he says himself on one of the first pages of his book. "Each regiment, as well Militia as Regulars, is allowed a surgeon and surgeon's mate. Their business is to attend to the diseases of the men at all times, whenever it is judged necessary. For this service the surgeon is allowed four shillings a day, the mate three shillings and sixpence. But out of this are levied from them considerable duties; to pay these, daily stoppages are made—for such is the custom of the Army; from the surgeon a shilling and from the mate sixpence. This makes their subsistence equal, so that each is limited to a guinea a week; and on this they may subsist as well as they can. . . . . . . The surgeon and mate are exempted from all duty, as it is called in the Army—such as mounting guard, attending courts-martial, and such like; their charge alone being confined to the sick. They rank as regimental staff officers, and are considered as an appendage to the corps. In the line of actual subordination the surgeon ranks not only below the

youngest ensign, but the quartermaster and adjutant; and the mate again below the surgeon. The surgeon receives a commission signed by the Secretary of War, or, if abroad, by the Commander-in-Chief there, who has authority to grant it; the mate only a warrant signed by the colonel of the regiment into which he is about to enter. This subjects him to some inconvenience . . . . . . in that he is liable to confinement in the same ignominious manner as a private, and this even at the pleasure and caprice of the youngest ensign of the corps. . . . The surgeon or the mate must be present at all regimental punishments, *i.e.*, at all times when any of the privates are for certain misdemeanours sentenced to be flogged. Their business is to watch the suffering delinquent attentively, and to order him halberts whenever he is thought in danger, whether the sentence of the court-martial be altogether executed on him or not. In this the Commanding Officer has it not in his power to control him if he thinks it expedient to assert this right of opinion and authority . . . . . The surgeon and mate are obliged to attend field days; their business in the field is to give assistance should any accident take place. . . . . . Each regiment has an hospital for its sick, provided a house for that purpose can be procured in the place where they are quartered. To defray the expense of this, government allows about £30 sterling per annum in some regiments. I believe, indeed, this is the allowance in most. If there be any overplus it is applied to the purchase of wine for the sick, utensils for the house—such as dishes, spoons, &c. Out of this, sixpence a day is also paid to a nurse in some regiments—an indispensably necessary servant for an hospital. . .

"To supply medicines, each private pays a penny a month, each non-commissioned officer a penny three farthings; the non-commissioned officers I call the drummers, corporals, and sergeants. Besides this, when the regiment is encamped, government sends him a chest of medicines as an addition to the medicine money."

These descriptions seem to carry us back ages, but it is little more than a hundred years ago that these things happened. A description of the hospitals is, however, perhaps still more characteristic. In the first place, they were not always hospitals, and the men had to be attended in their

billets, tersely described as "generally some uninhabited garret or lumber-room, or some back house where a few beds are erected, which places are set apart for soldiers, because fit for no other use." But even if there was a hospital, what was its condition? The following is the picture of one, drawn from the life.

"I have seen it consist of only two small rooms, one above the other, with the kitchens which made the ground floor; and in each of these no fewer than twelve men, though the room did not measure above 12 feet by 15, the place being almost one continued bed without spaces between, instead of distinct beds. Into this crowded spot the worst cases only were sent; some chronic cases, some acute fevers, some punished men with their backs suppurating and emitting a smell, intolerable even to people in health."

The nursing arrangements matched this. In rare cases there was a woman nurse, but usually an "orderly man" detailed from the regiment, and changed every twenty-four hours, thus preventing him from acquiring any experience or interest in the work, and "as often as not a clumsy, heedless fellow, into whose head all the men on earth could not instil a single idea of the duty he is to discharge." Small wonder if mortality was high.

One of the duties of the regimental surgeons of those days was to attend all floggings, with the right of ordering the punishment to be stopped should the delinquent be in a dangerous state. The necessity for this can be understood when we read of punishments of a thousand lashes being ordered and inflicted. In fact, in several cases men were actually flogged to death; in one instance of which, however, the attending surgeon was tried for manslaughter. But even in an ordinary case, suppuration and prolonged prostration were practically bound to follow. The man had previously been confined in the guard room, often for some weeks, "never having his clothes off, or out of it, except to the necessary, under the care of a sentinel." In many regiments it was "likewise customary never to wash the cats after punishment, but to let the blood dry on them to render them more severe." It is scarcely necessary to point out that in a man debilitated from long confinement, wounds brought about by such a septic instru-

ment took the worst possible course. But better than any theories are the description of actual cases. "Henley for desertion received 200 lashes. . . . . When the wounds were cleaned, and the skin and bruised parts had suppurated off, the spine below the trapezius and part of the scapula were laid bare. . . . . A large abscess formed below his left shoulder . . . . on the fourteenth day after his punishment I opened it, from which issued more than 2 lbs. of pus mixed with blood; before it was opened its bulk was as large as the crown of a hat. . . . . It was upwards of seven months before he was so far recovered as to be able to do his duty." In another case Hamilton was able to see "down from the trapezius, between the cutis and the muscular parts to the last vertebræ of the loins" as the result of a large abscess.

What frequently added to the severity of the punishment was that it was occasionally, especially in severe sentences, given in instalments of two to four hundred lashes each. As the second and later instalments were inflicted on a back but newly-skinned over the sufferings were proportionately much greater. I need only quote one case to illustrate this. "Hall was sentenced to receive 500 lashes for housebreaking. He got 400 of them before he was taken down, and in the space of six weeks was adjudged able to sustain the remainder of his punishment, as his back was entirely skinned over. The first twenty-five of this second part tore the young flesh more than the former 400, the blood pouring at the same time in streams. . . . . By the time he got seventy-five his back was ten times more cut by the cats than with his former 400, and it was thought prudent to remit the remaining twenty-five and to take him down."

The usual mode of flogging was to tie the man up to the halberts and to inflict the punishment on his back, a fresh drummer being told off for every twenty-five lashes. A more dangerous custom in some ways was in use in some regiments. "Instead of cats, rods of willow are made use of. The whole regiment is drawn up in line; the prisoner runs naked the whole length of the line, and every man strikes as he passes." Though the instruments were less severe, yet the fact that the blows distributed themselves over the whole body "from neck

to heels," so often injuring more sensitive and important parts, made the ultimate prostration often greater.

I cannot omit quoting now an excellent description Hamilton gives of a wound in his hand which became septic, if only to give the sentence with which he concludes it, as giving a clear idea of the side issues in which scientific men of the day lost themselves. "In the autumn of 1782, while I was employed in examining the structure of the joints of a horse's leg, while I was engaged with a saw in taking off the hoof . . . I ran the teeth of it obliquely over the second joint of my thumb; but so slight was the injury that the cuticle was only raised and torn a little, yet the pain and inflammation which succeeded in the part that evening entirely deprived me of rest. This continued unremittedly for upwards of a week, during which I slept little. Everything that seemed to bid fair to allay the irritation and inflammation was applied. It spread up my wrist, the part became numbed. I lost both the use of motion and feeling in it, while the joint of the phalanx above that which was wounded became so painful on the slightest motion that it created me great uneasiness. It continued ill for upwards of four months, and it was much longer before I could grasp any substance with that thumb as small as a pin."

So far the whole might be a page out of a modern case book, but the last sentence "a characteristic of the time." All this the author quaintly concludes "could not proceed from a wound so slight as scarcely to bring a drop of blood had not some cutaneous nerve been partially wounded."

Yet while recognising the limitations of the age, we must bow to the keen scientific ardour of the man. He saw clearly the crying necessity of a more liberal scientific education than the average medical man of the day received, who was often left to pick up his knowledge as best he could in some apothecary's shop. He took great pains himself to keep abreast with the most modern treatment of the time. He almost led the way in the use of arsenic as a cure for malaria, a treatment which Dr. Fowler had just discovered. He was one of the first to put to practical proof Dr. Browne's theory that in æsthenic fevers stimulation was indicated, and not depletion. In fine, he lived up to what he said, when he laid down "that to make experiments may require more than the medicines com-

monly in use, we grant; but if the surgeon has improvements in view he will not stop here for the sake of saving a trifling expense. A little money expended in such laudable pursuits will be considered as nothing when compared to the satisfaction he may receive or the good he may do both himself and others."

With all these evidences of a scientific spirit, we find traces of many a difficulty with the combatant branch. Quite apart from such questions of status, which prevented the surgeon from being presented, and made the surgeon's mate liable to be tried by court-martial and "flogged like one of the soldiers." we read of disastrous cases of the interference of officers with the practice of the surgeon. One case in particular is quoted, where a man was taken out of hospital and delivered over to his regiment by his commanding officer with the result that death followed. But as the author caustically remarks, "I have always found young officers, who knew but little about their own duty from their short service, most troublesome in this respect. However," he adds, "I must candidly acknowledge that such are the regimental practitioners of physic that a spur not a curb is often wanted."

It is not always with satisfaction that one can close a record of one's forbears in the flesh or in the spirit. In this case, however, I cannot turn tho last pages of his book without feeling that they are the work of a man who whatever his difficulties strove to overcome them, and steadily held high the standard of efficiency and thoroughness.

Translation.

ON A NEW PROTOZOON (PIROPLASMA DONOVANI, LAVERAN AND MESNIL), THE PARASITE OF AN INDIAN FEVER.

By A. LAVERAN and F. MESNIL.

(*Comptes Rendus des Séances de l'Academie des Sciences, cxxxvii., p. 957.*)

Laveran and Mesnil, after recapitulating Leishman's, Donovan's and Ross's observations, proceed:—

The preparations which we have received by the kindness of Dr. Donovan are from several cases. There are spleen and liver smears both containing parasites. Some of these preparations were well stained by Donovan (Romanowsky method), others we have ourselves stained by the blue Borrel-eosin tannin method.

In these preparations the parasite is seen as a small pyriform, oval or spherical body, free or enclosed in a red blood corpuscle (figs. 1 to 5). In some of our preparations pyriform bodies which Ross, by the way, does not mention are in the majority. In shape they exactly resemble the most typical forms of *Piroplasma bigeminum* of Texas fever and are no doubt the typical form of the human parasite which we are describing. They measure 2·5 to 4 μ in length and 1·5 in width (figs. 7 to 9).

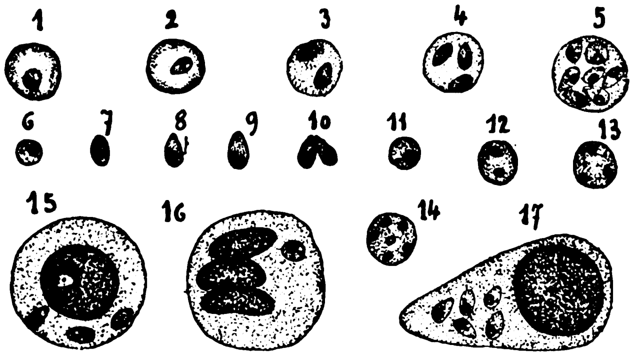
In these bodies, as also in the round or oval ones, there is a fairly large chromatin sphere (probably karyosome); in the pyriform bodies it is usually placed at the side of the larger extremity. On the same transverse diameter as this mass there is generally another smaller round or rod-shaped body; this is sometimes joined to the first by a thin pedicle. The remainder of the parasite is finely granular and nearly clear.

Red blood corpuscles into which parasites have entered alter rapidly. They become pale and granular, and do not take up stains like normal cells. One corpuscle may contain from one to seven or eight parasites without becoming hypertrophied in proportion. We came across one which had fourteen parasites; it had about trebled in size.

Ross does not believe in intracorpuscular parasites. To us any other interpretation of the numerous figures we and Ross have seen seems difficult. Donovan had called our attention to this. Let us simply recapitulate. (1) Some of the corpuscles had retained their normal staining reactions, either throughout or only at the periphery. (2) The substance outside the parasite varies inversely as the number of parasites present. This is easily explained in our hypothesis, but hardly by Ross's theory of "a matrix in which spores are produced." Leishman agrees with us as to intracorpuscular forms. Finally, infected corpuscles which are not found in smears made

post mortem are present in proportion to the excellence of the preparation made by puncture during life. Free forms are, however, always much more numerous than intracorpuscular ones. These intracorpuscular forms suggest that at some time or other the parasites must be found in the peripheral circulation. Donovan says he has not yet found them there, and there were none in a preparation which he sent us.

We have frequently found the perfect parasites in varying numbers enclosed in mononuclear or polynuclear leucocytes; some even seemed to be in the nucleus (fig. 15), but in these cases the nucleus was always altered.



FIGS. 1 and 2.—Red blood corpuscles normal in shape and appearance, each containing a small piroplasma.
FIGS. 3, 4, 5.—Altered red blood corpuscles containing 2 to 7 parasites.
FIGS. 6, 7, 8.—Free parasites—round, oval and pyriform.
FIG. 9.—Pyriform parasite dividing.
FIG. 10.—Two pyriform parasites, probably showing longitudinal division.
FIG. 11.—Large round parasite.
FIGS. 12, 13, 14.—Forms of multiplication by repeated division of the nucleus.
FIGS. 15, 17.—Large mononuclear leucocytes, with parasites in the protoplasm as well as in the nucleus.
FIG. 16.—Polynuclear leucocytes with a parasite in the protoplasm (× 1,000).

The parasites appear to multiply by simple division (this is the commonest way) or by multipartition. In the first case the large chromatin mass divides into two and the pyriform body, which has hardly increased in size, splits longitudinally (figs. 9, 10). In the second case the parasite slowly increases in size and becomes globular; soon its nucleus divides; this results in the formation of bodies which may attain the diameter of a red blood corpuscle with from two to eight chromatin masses; the smaller chromatin particles are frequently absent, or are fewer than the large masses. These large bodies with four to eight nuclei closely resemble red blood corpuscles containing the same number of parasites and sometimes it requires a little care to distinguish them. Ross must have confounded these two conditions. At the termination of this evolution there is apparently a radial division of the parasite into mononuclear elements. Some rosettes which we have seen we think must have originated in this way. The parasites never at any

time contained any pigment. Where should this new organism be placed? The almost constant existence of the small chromatin mass so like the centrosome of trypanosomes naturally suggests a trypanosome or at least one of the flagellata. Neither Donovan, Ross, nor ourselves have been able to demonstrate a flagellum.

We believe that we can eliminate this hypothesis. The facts which we have enumerated show that there is no essential difference between Leishman's bodies and the known piroplasmata—especially the *P. bigeminum.* A pear-shaped and longitudinal division is the rule, as in *P. bigeminum*—division into four or more is frequently seen in piroplasmata. Finally, the existence of intracorpuscular forms removes the last objection to this view.

We can therefore only adhere to the name *Piroplasma Donovani* which we originally gave to this parasite. The fact that this human piroplasma has been found in two places in India as far apart as Madras and Calcutta suggests that the geographical distribution of the disease is an extensive one. It would be well to organise a systematic search for Leishman's bodies in the non-malarial remittent fevers of Southern Asia, and especially of French Indo-China.

The piroplasmata already occupy an important place in veterinary pathology. This is the first time that a definite human disease has been ascribed to a well-defined piroplasma.

NOTE.—Spotted fever of the Rocky Mountains was ascribed by Wilson and Chowing to a piroplasma; the nature of the latter is doubtful; in any case it has nothing to do with the Indian fever with which we are now dealing.

Reviews.

THE PRACTICAL DETAILS OF CATARACT EXTRACTION. By H. Herbert, Major I.M.S. Second Edition. London: Baillière, Tindall and Cox, 1903.

Little more than a year has elapsed since the issue of the first edition of this small manual, so that only slight alteration has been necessary. The author prefaces the first edition by stating that "This account of cataract extraction, and of matters directly bearing upon it, differs from others in that it is largely made up of a mass of practical detail, ordinarily omitted. and it includes a certain amount of original observation throughout. I have attempted to record what I have learnt from the performance of between two and three thousand operations."

We presume that few countries in the world can offer such a field for cataract operation as does India, and therefore the experiences of an ophthalmic surgeon in that country must be most valuable.

It may be said that the native of India will stand operations better than a European, and therefore the statistics of good results may show a higher figure; but on the other hand, as the author remarks, this advantage is probably more than counterbalanced by the bad average local (conjunctival) conditions. The preparatory treatment of the patient before operation is most carefully given, each important point being insisted upon, and yet no useless and unnecessary array of precautions brought forward.

Under the description of the operation the author states "dexterity in operating is made up of those elements, rising in order of importance thus: (1) A steady hand; (2) a light hand, combining a fine muscular sense with a delicate sense of touch; (3) the most important—experience.

He thinks that Nos. 1 and 2 can be developed greatly by exercises, and recommends the practice of carrying about fixation forceps with a strong spring, and manipulating the blades without tremor in various positions.

Regarding treatment after operation he remarks: "It is most important to examine the condition of iris and pupil with local illumination the day after operation. It is only thus that the efforts of reaction to traumatism can be rendered transient and innocuous, and the onset of iritis regularly and systematically controlled. In few of our cases is atropine entirely withheld, and in a fair number the question to be determined for the first few days is how much atropine the patient can stand, rather than how much is required."

We notice that Major Herbert prefers the orthodox method of extraction by iridectomy and capsulotomy, and not of the lens in its capsule as performed so largely and successfully by some of his colleagues. We can recommend this book as a thorough practical and useful guide to those interested in ophthalmic surgery.

E. C. P. FOWLER.

SQUINT: ITS CAUSES, PATHOLOGY AND TREATMENT. By Claud Worth, F.R.C.S. London: John Bale, Sons and Danielsson, Ltd., 1903. Pp. 229.

Mr. Worth has produced a notable book, conspicuous for original views courageously and lucidly presented. In his modest Preface he draws atten

tion to the extremely unsatisfactory results of the usual routine treatment of squint, unsatisfactory mainly in the well-known fact that the acquisition of any sort of binocular vision is quite the exception. By examination a very large number of cases of squint (2,337 in all, 1,729 of these being convergent), and watching the results of treatment, he has arrived at certain important conclusions, which form the basis of methods of treatment by means of which he claims that cases of monolateral squint can be nearly always perfectly cured, *having good vision in each eye and good binocular vision* (*the italics are mine*).

The first three chapters give clear, if somewhat compressed, descriptions of errors of accommodation and refraction, the various grades of binocular vision, and the clinical varieties of convergent squint. In the fourth chapter the author discusses the etiology of convergent squint, showing that neither the "muscle theory" nor Donder's "hypermetropia theory" can be considered satisfactory, and subsequently demonstrating conclusively that defect of the *fusion sense* is the fundamental cause of the anomaly. Congenital and acquired amblyopias are dealt with in Chapter V., while unusually clear details of the methods to be adopted in investigating cases are set forth in Chapter VI.; in "the Treatment of Convergent Squint" (Chapter VII.) Mr. Worth enters at length into the consideration of the five therapeutic measures, any or all of which may be found necessary. These are: (1) Correction of refractive error. (2) Occlusion of fixing eye. Atropisation of the *fixing* eye only. (4) Training the fusion sense. (5) Operation.

The use of atropine for the fixing eye alone is an exceedingly efficacious procedure and based on the soundest of principles. The fusion sense is trained by means of an instrument known as the "amblyoscope"; the most favourable time for training is between the ages of three and five years. Details of amblyoscope training, illustrative cases, divergent squint, and operations are considered in succeeding chapters. The chapter on operations is particularly good, but might with advantage have been more fully illustrated.

The above sketch is necessarily the barest outline, but will serve to give a general idea of the scope of the work; a careful perusal of the book itself is necessary for the proper appreciation of its remarkable distinction and originality.

Mr. Worth has some of the defects of his qualities. Here and there he assumes a dogmatic *ex cathedra* tone in expounding his views which is irritating and unnecessary; and his choice of disparaging adjectives in alluding to previously accepted methods of examination and treatment is not always fastidious. These, however, are but slight blemishes: judged as a whole his book must be pronounced one of the most valuable and stimulating contributions to ophthalmic literature that has seen the light of recent years.

M. T. YARR.

A very interesting communication comes from the Hygienic Laboratory, University of Michigan.

F. G. Novy, Sc.D.M.D., and Ward J. McNeal, A.B., have succeeded in cultivating two of the trypanosomes outside the body.

To most of us this seemed an impossible task, as these protozoal parasites died off as a rule in a few days when kept in aseptic blood serum *in vitro*. It

was thought that if they died so quickly in their own native fluid when removed from the blood-vessels, how little chance would there be of their surviving, much less growing and developing, in any other fluid. They at first worked with the ordinary rat trypanosome (*Trypanosoma Lewisi*). The results they obtained mark a distinct advance in our knowledge of the animal parasites, since this was the first time that a pathogenic protozoon was successfully cultivated and its relation to the disease demonstrated by inoculation of pure cultures. At that time they expressed the belief that the methods employed would probably be found to be applicable to other trypanosomes, and this view they have been able to confirm with reference to one of the most important organisms of this group, namely, *Trypanosoma Brucei*, the cause of nagana or the tsetse-fly disease of South Africa.

It has been shown that the *Trypanosoma Brucei* dies out very rapidly in the cadaver, sometimes within a few hours, and that this occurs even when the blood is transferred to a tube. The longest that anyone has been able to keep the parasite alive *in vitro* has been about six days. Under these conditions no evidence of multiplication has been observed. The virulence of the blood when kept in tubes is preserved longer than when the blood remains in the cadaver, but, only exceptionally, has it been found to persist up to the fourth day. It seemed as if this organism was essentially an obligative parasite, and as such incapable of existing outside of the living animal.

The methods which they employed were the same as those used for cultivating the rat trypanosome.

The culture medium employed in all of their work was ordinary nutrient agar, containing variable amounts of defibrinated rabbit's blood. In the water of condensation, which accumulates in tubes or flasks containing this medium, the rat trypanosome grows readily and luxuriantly. No difficulty was experienced in starting an initial culture of this trypanosome from the blood of an infected animal.

The nagana trypanosome does not take readily to this same medium, and a great deal of difficulty was experienced in obtaining cultures of this organism. When, however, an initial culture is once obtained, and the parasite has become used to its new soil, the subsequent cultivation is more easy.

At the present time they have succeeded in carrying on the cultures to the seventh generation. In other words, this culture has been maintained under artificial conditions for 77 days, and there is no apparent reason why it should not be cultivated indefinitely.

When the nagana blood is planted on blood agar most of the trypanosomes rapidly die out; so much so, that an examination may fail to show a single living form and thus give rise to the impression that the culture is a failure and lead to the discarding of the tubes. And yet, a few surviving organisms are present and succeed in adapting themselves to the changed condition, and from these the culture begins. The whole phenomenon is very suggestive of a survival of the fittest.

A study of the artificial cultures shows that the virulence of this organism is variable and that it can be altered at will. This is an exceedingly important fact, since by means of attenuated cultures it may be feasible to secure the much desired immunisation.

The cultivated *Trypanosoma Brucei* is readily distinguishable from that of *Trypanosoma Lewisi*. Thus, while the latter has almost homogeneous contents, the former is characterised by the presence of two or more bright, highly-refracting globules, usually placed near the anterior or flagellar end. At times the number of the globules is increased, as when the culture is kept at 34 C. In size these globules may attain one micron.

The *Trypanosoma Lewisi* varies considerably in size. Some forms are found which are not more than one or two microns long, not including the whip. Others are about the diameter of a red blood cell, while usually they average about 15 to 20 microns.

The *Trypanosoma Brucei* shows less variation in size and averages 15 microns in the living condition.

The motion of the two organisms is entirely different. Thus, while the rat trypanosome is frequently seen darting about in an almost straight line and with great speed, the nagana parasite usually shows only a slow, wriggling motion and scarcely departs from its place. The wave motion passes slowly along the thick undulating membrane and imparts the appearance of spiral rotation to the entire cell..

D. Bruce.

Current Literature.

A Case of Double Fracture of the Lower Jaw, Treated Satisfactorily by Means of an Interdental Splint.—Double fractures of the lower jaw are not very common, and satisfactory treatment is somewhat difficult. There are drawbacks connected with the application of sutures, which are apt to become loose after a few days and fail to keep the fragments in apposition. Staff-Surg. Dr. Williger, of Breslau, reports (*Deutsche Militärärztliche Zeitschrift*, October, 1903) the case of a trooper who was kicked by a horse on the left side of the face. On examination the lower jaw was found to be broken between the second and third left molars, and there was a second fracture between the premolars on the right side. There was a contused wound of the skin over the angle of the jaw on the left side and somewhat free hæmorrhage from the fracture on the right. The fractured portion was depressed and drawn inwards. With the exception of the first right premolar, which was broken off at the neck, the teeth were uninjured and sound. For three days the treatment consisted in keeping a sling bandage to the chin and syringing the mouth with a 10 per cent. solution of hydrogen-peroxide. The gap where the tooth was broken served for the passage of a tube through which nourishment was given. The next step was to take plaster-casts of the mouth—a somewhat tedious process, requiring skill and practice. Portions were taken separately and then fitted together so that a positive model could be obtained. The preparation of the splint was the next step. A cast was taken in wax, applied to the model and extended over the whole row of the teeth which it covered down to the edges of the gums. With this a caoutchouc splint was constructed and strengthened with gold wire at both ends and over the fracture on the right side. Before its application, the part of the jaw between the fractures was pushed by the fingers into as correct a position as possible, the teeth dried, and the splint covered on the lower surface with a thin, very adhesive tooth-cement. It was then placed in position over the teeth and kept there with the fingers until the cement became quite hard. On the day following the jaw could be used for biting, and after a week solid food could be dealt with. Three weeks later the splint was removed; the broken ends had firmly united, but the left wisdom tooth projected beyond the other molars, and was therefore removed. Six weeks after the accident the man returned to duty. The manipulations connected with taking the casts and fitting the splint were effected without chloroform. A dentist undertook the mechanical part of the work.

The Causation of Swelling of the Foot.—This somewhat indefinite term (*Fussgeschwulst*) is used to designate enlargement of the foot, due either to fracture of the metatarsal bones or to periostitis. It forms the subject of a lengthy communication to the *Deutsche Militärärztliche Zeitschrift*, January, 1903, by Staff-Surg. Blecher. The conditions are most often due to prolonged marching and to false steps, twisting the foot, stepping into a hole or on a stone. In the absence of crepitation it is impossible to distinguish between fracture and periostitis. In cases of fracture the second metatarsal bone of the left foot is the part most often implicated. Disability for from twenty-one to forty-seven days is the usual result; a shorter time may suffice in cases of periostitis. The largest proportion of cases is noticed among recruits in their first year.

After discussing the mechanics and statics of the foot, and attending to the rarity of fractures of the fifth metatarsal bone, Dr. Blecher explains the frequency of injury to the second. When a stone or the edge of a rut or hole gets under the middle of the foot and occupies the concavity, if the ball of the great toe does not reach the ground the projecting heads of the middle metartarsals have to bear the weight of the body, and fracture may take place. Fatigue plays a large part in the causation of such injuries, which are especially liable to occur when tired men have to march over rough, stony ground. A similar effect is produced by ill-fitting boots, which cause their wearers to march in a constrained manner. With regard to the fact that these injuries occur almost exclusively among soldiers, Blecher thinks that the difference can be explained by remembering that civilians, although they may carry heavier loads, and walk longer distances, can rest when they feel tired, whereas soldiers, as a rule, go on as long as they possibly can do so. Civilians can also take care of themselves in other ways. The conclusions arrived at are as follows :—

Fractures of the metatarsal bones and periostitis are to be regarded as varying only in degree; in a general way they cannot be clinically distinquished, and their occurrence depends upon the variations in the severity of the injury and the firmness of the bones. Foot-swelling is caused by an abnormal load being placed on the middle metatarsal bones normally not accustomed to such pressure. It occurs as a result either of sudden pressure or of sinking in of the metatarsal arch after great fatigue. Foot-swelling occurs among soldiers because they are often compelled to continue marching when thoroughly tired.

Military Service and Bodily Weight.—This subject is discussed in a lengthy article in the *Deutsche Militärärztliche Zeitschrift*, September 2, 1903, by Chief Surg. Dr. G. Schmidt, of Breslau. In judging of a recruit's fitness for service, foreign army surgeons have selected special evidences of development as criteria which will assist the examiner in arriving at a rapid conclusion. The list is a somewhat long one, and includes such characteristics as the capacity of the thorax as altered by the breathing, the sagittal measurement of the chest and that across the shoulders, the length of the sternum, trunk and legs, the circumference of the trunk and limbs, of the pelvis and over the shoulders, and of the head.

In Switzerland, a minimum measurement is prescribed for the upper arm. One surgeon notes the circumference of the right calf. As may be imagined, different surgeons hold different opinions as to the value of these criteria. The majority attach most importance to the size of the body, the measurement of the thorax, and the weight. Opinions also differ as to the value of this last, varying as it does according to national and personal peculiarities. Schmidt insists on attention being paid to alterations in the weight. The results of his investigations into the cases of 4,100 recruits show that three months after enlistment, notwithstanding the severity of the training, three-fourths of the men had increased in weight. A year later this proportion rose to four-fifths; in about one-twentieth there was no diminution, and in a similar proportion there was continuous loss of weight. The increase was most rapid during the first three months, averaging 2·3 kilos.; in the succeeding twelve months the average was only ·88 kilos.

It may be stated that as a general rule the recruits returning home after two years' service are greatly improved in health and strength. Among recruits in Russia loss of weight is at first the rule, though increase is after-

wards noticed. In his own cases, Schmidt observed that the increase of weight was least in the tallest and heaviest men, and most marked in those of an opposite class. Also that men occupying the upper stories of lofty barracks showed less increase in weight than their comrades below them; but this difference became less as time went on.

Going on to consider other causes as affecting the increase of weight, the writer discusses the effects of previous occupations, age, family history, and the like, and points out that the progressive increase in soldiers' weight is due to a variety of circumstances, most of them belonging to a period anterior to enlistment. Among such conditions the most favourable are absence of predisposition to disease, moderate size and weight, rural occupation, dwelling at a distance from large cities, age about 20 at enlistment, residence in the Midland or the Western districts of Germany, and occupying the lower story in barracks. Increase of weight during the recruits' service shows that the conditions under which they are living are favourable and good; a marked diminution may indicate latent tuberculosis. Too much care cannot be taken in watching for and dealing with cases of this disease, and endeavouring to trace its origin.

The Height of Barracks as Influencing the Bodily Development of Soldiers.—Chief Surg. Dr. G. Schmidt, of Breslau, adduces several facts (*Deutsche Militärärztliche Zeitschrift*, September 3, 1903) showing that the health of soldiers, as indicated by their weight, is prejudicially affected by the height of the barracks they occupy. For many continental towns barracks several stories high are still in use. In Paris and Lyons accommodation is thus provided for numbers varying from 2,230 to 5,000 men. The Prussian regulations forbid, as a general rule, the construction of barracks of more than three stories, including the ground floor. The drawbacks connected with the more lofty barracks are obvious. The air in the upper stories is contaminated by the exhalations from below, where more dirt is liable to accumulate; and noise increases with the number of men. Contagious diseases having broken out, are liable to spread, and disinfection is difficult. But the extra work involved in mounting the stairs several times daily is a constant drawback. In a barrack in Antwerp there are eighty-nine steps in the highest story.

In civil life, some statistics show that the health of residents in the upper stories of lofty buildings is not so good as among those in the middle portions. But no accurate inference can be drawn therefrom, inasmuch as the inmates differ greatly in their habits of life, work, food, and other particulars.

Schmidt's observations were made in 1897 upon a regiment of Grenadiers of the Guard in Berlin, quartered in barracks three stories high, besides the ground floor. In all other respects the sanitary arrangements were very good. The number of recruits under observation from 1897 to 1901 was 4,025. After three months 75 per cent. had increased in weight. At the end of a year it was found that the increase (2·06 kilos.) was least among the occupants of the third story; next came those of the second and first; those on the ground floor showed the maximum increase (3·22 kilos.). These differences, as far as the highest story was concerned, were found to be maintained among 693 men after fifteen months' service; but on the whole there was a tendency to equalisation of the increase. Schmidt considers that the injurious effects of the extra work imposed upon the occupants of the highest stories is clearly demonstrated, and advocates barracks consisting only of a single story above the ground floor.

REPORT OF THE ROYAL COMMISSION ON THE WAR IN SOUTH AFRICA.

As the actual volumes of this important report are unlikely to be accessible to the majority of members of our Corps, while the evidence contained in their pages cannot fail to be of interest to our readers, we propose giving a *precis* of the evidence so far as it relates to medical organisation before and during the late campaign. For this summary, which is continued from p. 80, vol. ii., we are indebted to Lieut.-Col. Edwin Fairland. It deals mainly with evidence regarding medical equipment.

III.

(Q. 3589.) Surg.-Gen. Sir W. Wilson, P.M.O. in South Africa, who served throughout the war, examined, said :—

I wanted 10 per cent. of beds for all the troops in South Africa, and I was promised that; they said they would make it good to me as soon as they could.

The Bearer Companies and Field Hospitals were particularly good, nothing ever appeared like them before. The first few General Hospitals were good also, but when we went on, the R.A.M.C. practically ended with the 5th Division; after that the Bearer Companies and Field Hospitals consisted of untrained or partially trained men, probably one officer and the rest civil surgeons.

The Natal Army went complete, but they took half of the R.A.M.C. from me. About 40,000 men had about 1,000 N.C.O.'s and men attached to them (of course it was not enough). I wanted 9,000 at least; on the Cape side the framework was very weak, it was excellent, but very small. In Cape Town I raised about 800 Bearers, called the Cape Medical Staff Corps, put them into Companies intending them for the field to take the place of the R.A.M.C., who were to come back to me, being trained men. Any man with a little training will do in the field, as he has only to carry the wounded. I had only five days' notice to supply a great number of Divisions going into the field at Modder River with Field Hospitals and Bearer Companies—a totally unexpected demand. We had terrible difficulty with the transport, and I never got the whole of these medical units into the field together at one time. In the advance to Pretoria some were left standing in the streets as the transport was not there.

All these difficulties were brought before the former Commission, but I do not think it ever saw the significance of them. They arose from the want of officers and of efficient transport. The framework of the regular service, upon which I had to build a system to look after an army of more than 200,000 men, was simply out of all proportion—too small. I am speaking of the ordinary establishment. It was fair enough on the Natal

side; but on the Cape side, where all the difficulties came in, and where we had to go away hundreds of miles from the lines of communication, and where our transport failed, it was a long way too small—out of all proportion.

The former Commission were wrong in saying I should have had more Field Hospitals and Bearer Companies; anyone conversant with the Service would have known that they are only made as they are ordered; they are never ready.

(Q. 3605.) Before we pass from the other point, on the question of the general establishment, it is stated on page 4 of the Report—" the R.A.M.C. was wholly insufficient in staff and equipment for such a war, and it was not so constituted as to have the means provided by which its staff could be very materially enlarged, or its difficiencies promptly made good." I think that is correct.

Q. 3607.) . . . The Military Authorities did all they could to provide you with transport, subject to the military exigencies? They did. Of course, food and ammunition must go first.

(Q. 3610.) There was no deficiency of supplies? I never had an insufficiency of medical supplies the whole time, and I had supplies of everything in the country, if I could only move it, but it was extremely difficult . . . It took No. 2 Hospital over two months to go to Pretoria. The equipment was in the trucks all the time. The truckage was short, but the engines were worse.

(Q. 3613.) As to these Bearer Companies you raised in South Africa; were you satisfied with their work afterwards? They were very good as Bearer Companies, but there was always a difficulty to get them to do general work afterwards when they came in from the field. They were not useful when attached to a hospital, and did as little as ever they could, but they were very good in the field. They failed in doing any kind of work about a hospital camp. It was extremely difficult to get anybody who could do sanitary work about the camp.

(Q. 3016.) As to the efficiency of the Officers? My own officers I valued the most, they knew what we wanted. Of the civil profession I had some experts in surgery and some in medicine, but they were not all-round men whom I could put in anywhere. The officer was a more general man, and he went in for sanitation and everything. The civilian was useful when I could keep him strictly to his own line, and not take him beyond. . . . I think there ought to be a sanitary branch attached to the P.M.O. There used to be a sanitary officer . . . but he was discontinued immediately after the Egyptian War of 1882; and that was the last time we had a sanitary officer in the field. The Commander-in-Chief at that time thought it was unnecessary, and that every medical officer ought to be an expert himself.

(Q. 3621.) Sanitary work has become rather a special subject since

1882 ? Every day more so; of course every R.A.M.C. officer is a sanitary officer, specially trained for it, and has to pass an examination in connection with it. . . . We want certain sanitary authorities, men of European reputation, whose opinions cannot be set aside. . . . I cannot speak too highly of my own officers and of a great number of the civil surgeons. I cannot forget what they did and the way they worked.

(Q. 3625.) . . . At Kimberley and Ladysmith they always had medicines . . . they wanted for no drug that could save a man's life. . . . I am distinctly of opinion that the sick did not suffer.

(Q. 3632.) As regards food, there again you say the sick did not suffer from any deficiency ? I think not; they were principally enteric cases, and the best treatment for enteric is starvation. More people are killed by enteric through overfeeding than from anything else.

(Q. 3633.) Questions were raised about the milk before the Commission ? Yes, they raised the question about having fresh milk during the siege, and of course that was ridiculous; but authorities have to count out the tins, and to be very careful of the number of tins they have. A question was raised as to why they had some tins of milk in Ladysmith when the siege was over. Of course, the Medical Officer could not settle the exact date on which the siege would end. There was a surplus, and fault was found by outsiders about that surplus.

At Bloemfontein it was a question of fresh milk entirely. The military authorities commandeered it for the hospitals; there was no squeamishness about it, all was commandeered.

(Q. 3640.) The Commission state in their Report: "The only general remark that we need make here is, that throughout the campaign (until quite recently) there was a deficiency of bedpans and commodes, the lack, of which often caused considerable discomfort and even suffering on the part of the patients" ? That only occurred for a short time at Bloemfontein, and I think they made the most of it at one hospital—a hospital the staff of which did not get on well together. As a rule the enteric cases did not require bedpans, the ordinary symptoms of diarrhœa being absent. . . . We had the full equipment provided by the regulations, and added wherever we could. . . . We requisitioned through the Ordnance, and sent all over South Africa, and purchased everything. . . . It is very hard to dogmatise about what occurred in South Africa, as what occurred there would probably never occur in any other part of the world we would go to. . . . The experience of the campaign will lead to modifications; the General Hospitals will have to be more elaborate, the bedsteads lighter, huts provided in the administrative quarters, one of the Field Hospitals (the third) to have some light pattern beds, be better equipped, and all hospitals should have pyjamas. When a man comes in, at present there are no clothes for him, although he may be deluged in blood, but according to the regulations there are no clothes to put him into. I remedied that very early by calling on

the Red Cross to give me pyjamas, and they used to supply every Field Hospital with generally 100 pairs. After a time the Ordnance did it as well. . . . I had no hesitation in buying up anything I wanted. At first medical officers were a little afraid to buy; we are never allowed to spend a penny at home, and we cannot do anything ourselves, but in a short time the medical officers turned out very well, and they purchased freely. I told them to purchase and send me the bills, and I would have them settled. No difficulty was raised (by the pay department). It was rather a new departure at the same time.

(Q. 3660.) The next point is ambulance waggons? Yes, we had a very good ambulance waggon called Mark 5, and it was the best waggon of any. The Natal waggon was too heavy. The Bristol waggon and the Irish waggon which the Irish Hospital took out, were all very bad. . . . We got a lot of tongas from India, presented by an Indian gentleman, with ponies, and they were really good. . . . I think they saved the situation as far as moving the wounded off the field is concerned. . . . We used also captured Cape carts freely. . . . I think every Bearer Company ought to have both kinds of vehicle (*i.e.*, light two-wheeled carts, and four-wheeled waggons). The regulations only provide ten ambulance waggons for each Bearer Company. We had a number of hospital (railway) trains; they were capital, and there never was anything like them seen in any part of the world before. There was a regular staff of two medical officers with each train; they carried about ninety wounded men, and had everything on board—cook, kitchens and nurses, and were used to bring down all the serious cases from the front. We often brought them from the battle-field in trains. In the Orange Free State the men were brought down in trucks; we could not get the trains up quickly enough. . . . there is no hardship in it in a lovely country with clear bracing air, and the sun not too hot. The trucks do not go fast, and there was always a medical officer and a few attendants. They were only slight cases, men reporting sick, and as they broke down from the field they were put into the trucks and sent down.

(Q. 671.) I wanted to take it generally from you, because the former Commission specially enquired into the details; the number of sick and wounded you say you estimated at 10 per cent.? Yes.

(Q. 672.) What was the actual number? From memory I would put it down at 8. It was less than the estimated number, but of course, in some places it was often higher, in some little areas. It was higher in Bloemfontein for a time, but the pressure was not on there very long. It was only at Bloemfontein that it exceeded 10 per cent. . . . We could not use the system of hospital trains, the bridge at the Orange River was broken down and took time to repair. . . . The Kaffir is a very dirty individual and suffers undoubtedly from enteric; this was proved by the *post mortems* made. It is the disease of the country. The Boers also suffer from it.

We arrived at Bloemfontein in the height of the enteric season; and

Cronje's force was suffering very much from it while they were watching Lord Methuen, and Lord Methuen was suffering too, though not so much.

Later on in the war we had means of boiling water in every camp and every blockhouse (and there were about 7,000 of them). At Kroonstad thousands of pounds were spent in getting water from deep wells, and the enteric practically disappeared.

Columns coming in brought enteric with them and disseminated it amongst the garrisons. All the garrisons and blockhouses were free from it in the last year, and everything they got could be traced to the columns. The men of the columns used to drink anything they could get hold of; they could not boil water, there was no fuel in the country, no wood—nothing.

(Q. 3685.) The Commission reported "That in July there were remaining available for duty about 224,000 in the Army and the Medical Staff consisted of about 1,000 medical officers (including civil surgeons), 7,000 hospital subordinates and 900 nurses"? Yes, there were about 400 R.A.M.C. officers in the country, and the rest were civil surgeons. The mass of attendants were untrained.

(Q. 3687.) Do you approve of the use of nurses? I started them the moment I got out, and took every nurse I could accommodate. I found we must have them. I did not engage any who had not been in a hospital before. One of the greatest difficulties we had was to accommodate these 800 nurses, and to get servants for them; that is one of the things that will always trouble us in the future. We can get any amount of good trained nurses. I could count the failures on my fingers. It was absolutely impossible to get female servants; I got Kaffirs, and finally hospital orderlies in some instances The nurses were invaluable. I took them without authority and got it afterwards.

(Q. 3691.) Do hospital orderlies require a special training? Yes, they are all trained at Aldershot and at every hospital they go to. There are nothing like enough of them. We followed the Army in having a Reserve, but that is not enough; we really want a new system of our own. I am considering my suggestions for the Report.

As regards the Regulations, I would alter the whole thing, root and branch, about the Bearer Company and Field Hospital; they should be one unit; I would not have the Bearers trained men at all, a fortnight's training or so will do for them; and I would have the Field Hospital section and the Bearer section under one officer. I would have them divisible and so on, but I would not put them into the field independent of one another . . . At the end of the war we went in for a combined unit, it was the only unit that would work.

(Q. 3703.) In what form did you carry your medicines—in liquid form? . . . . We had a more compact form than ever we had before; we used compressed drugs—they are tabloids generally made by Burroughs and Wellcome. . . . For the Stationary Hospitals we had an unlimited

supply of everything; and the best dressings that ever accompanied an army in the field. . . . The instruments were very good, as far as they went. We wanted more and we bought them . . . . Medical Officers were, as a rule, supplied with the most modern type of instrument.

(Q. 3717.) Have you ever seen a case of instruments which could be washed or disinfected as a whole? I do not think I have.

Q. 3718.) Have you ever heard that such cases are supplied in the Russian and German Armies? I have heard something about them. . . . I prefer myself to have every instrument washed separately. They are all put together into the sterilising apparatus.

(Q. 3724.) You said there was a deficiency or total absence of hospital clothing with the troops in advance? Yes.

(Q. 3729.) Is hospital clothing kept with the advanced troops there (in India)? No, I was in Afghanistan, and it was never with the army in the field . . . only on the lines of communication—at Stationary Hospitals.

(Q. 3732.) Had you a supply of hospital clothing at all the Base Hospitals and Stationary Hospitals (in South Africa)? Yes, we had all the usual hospital clothing.

(To be continued.)

Corps News.

Army Medical Staff.

Surg.-Gen. Sir W. D. Wilson, M.B., K.C.M.G., is placed on retired pay, dated January 1, 1904. He entered the Service on October 1, 1867, and was promoted Surg., March 1, 1873; Surg.-Major, October 1, 1879; Brig.-Surg., October 28, 1889; Surg.-Col, July 18, 1894; and Surg.-Gen., October 3, 1898. His war services are as follows: Afghan War, 1878-9-80—medal; Egyptian Expedition, 1882-4—medal, bronze star; Soudan, 1884; battles of Teb and Tamai. Despatches, *London Gazette*, May 6, 1884. Two clasps. Promoted Surg.-Major, ranking with Lieut.-Col.; South African War, 1899-1902; P.M.O., South Africa; advance on Kimberley; operations in the Orange Free State, April and May, 1900; operations in the Transvaal in June, 1900; operations in the Transvaal E. and W. of Pretoria, July to November 29, 1900; operations in Orange River Colony, May to November 29, 1900; operations in Cape Colony, S. of Orange River, 1899-1900. Operations in the Transvaal, Orange River Colony, and Cape Colony, November 30, 1900, to May 31, 1902. Despatches *London Gazette*, February 8, and April 16, 1901, and July 9, 1902. King's medal with two clasps, K.C.M.G.

Royal Army Medical Corps.

Capt. T. H. M. Clarke, C.M.G., D.S.O., from the Seconded List, to be Capt., dated November 30, 1903.

Col. J. F. Supple, C.B., is placed on retired pay, dated December 14, 1903. He entered the Service on April 1, 1867; was promoted Surg., March 1, 1873; Surg.-Major, April 1, 1879; Surg.-Lieut.-Col., April 1, 1887; Brig.-Surg.-Lieut.-Col., April 9, 1893; and Surg.-Col., May 29, 1898. His war services are as follows: Ashanti War, 1873-4; defence of Foomanah—medal with clasp; Afghan War, 1878-80—medal; Burmese Expedition, 1886-7; Senior Medical Officer, 6th Brigade. Despatches, *London Gazette*, September 2, 1887; South African War, 1899-1900; P.M.O. at Base, Cape Town. Despatches, *London Gazette*, April 16, 1901. C.B.

Lieut. C. H. Robertson, M.B., resigns his Commission, dated December 19, 1903.

Lieut.-Col. J. F. Williamson, M.B., C.M.G., to be Col., to complete establishment, dated December 20, 1903.

Lieut.-Col. W. J. R. Rainsford, C.I.E., to be Col., *vice* J. F. Supple, C.B., retired, dated December 14, 1903.

Royal Army Medical Corps (Militia).

Home District (late Middlesex) Company.—Supernumerary Lieut. (Hon. Lieut in the Army) G. J. D. Davies to be Capt., dated December 19, 1903.

Second Life Guards.

Surg.-Capt. J. H. Power, from Royal Horse Guards, to be Surg.-Major, dated October 21, 1903.

Royal Army Medical Corps Volunteers.

The Manchester Companies.—The surname of the gentleman appointed Lieut. in the *London Gazette*, of July 28, 1903, is Fyfe-Waterston, and not as therein stated.

The Manchester Companies.—Capt. J. W. Smith, M.B., resigns his Commission, dated January 6, 1904.

Army Medical Reserve of Officers.

Surg.-Lieut. A. Mackenzie, 3rd Volunteer Battalion, The Prince of Wales's Own (West Yorkshire Regiment), to be Surg.-Lieut., dated December 16, 1903.

Surg.-Capt. J. Shaw, M.D., having resigned his Commission in the Volunteers, ceases to be an officer in the Army Medical Reserve of Officers.

Surg.-Capt. F. A. Brooks, 1st Suffolk and Harwich Royal Garrison Artillery (Volunteers), to be Surg.-Capt., dated December 19, 1903.

The notification regarding the promotion of Surg.-Lieut. H. G. O. Collett, in the *Gazette* of November 10, 1903, is cancelled; intimation of his death prior to that date having been received.

Surg.-Lieut.-Col. T. J. Aubin, M.D., having attained the prescribed limit of age, is removed from the Army Medical Reserve of Officers, dated January 9, 1904.

Surg.-Lieut.-Col. R. T. Cæsar having attained the prescribed limit of age, is removed from the Army Medical Reserve of Officers, dated January 9, 1904.

Surg.-Lieut.-Col. F. E. Fenton having resigned his Volunteer appointment, ceases to belong to the Army Medical Reserve of Officers.

Surg.-Capt. J. McMullen, M.B., having been retired from the Volunteers, ceases to belong to the Army Medical Reserve of Officers.

Surg.-Capt. F. St. John Kemm having resigned his Volunteer appointment, ceases to belong to the Army Medical Reserve of Officers.

Imperial Yeomanry.

Westmorland and Cumberland. — Surg.-Capt. J. E. Bowser, M.B., to be Surg.-Major, dated January 2, 1904.

Volunteer Corps.

1st (Banff) Royal Garrison Artillery.—Surg.-Major W. Fergusson, M.D., to be Surg.-Lieut.-Col., dated December 19, 1903.

2nd Volunteer Battalion the Royal Warwickshire Regiment.—Brig.-Surg.-Lieut.-Col. C. Dukes, M.D., Senior Medical Officer, Worcester and Warwick Volunteer Infantry Brigade, resigns his Commission, and is granted the honorary rank of Surg.-Col., with permission to wear the prescribed uniform on retirement, dated December 19, 1903.

3rd (Cambridgeshire) Volunteer Battalion the Suffolk Regiment.—Surg.-Lieut. A. W. Clark resigns his Commission, dated December 19, 1903.

4th (Perthshire) Volunteer Battalion the Black Watch (Royal Highlanders).—Surg.-Lieut. W. Haig, M.B., to be Surg.-Capt., dated December 19, 1903.

The Severn Division, Royal Engineers (Submarine Miners).—Surg.-Capt. W. L. Edwards to be Surg.-Major, dated January 2, 1904.

2nd Volunteer Battalion, Alexandra, Princess of Wales' Own (Yorkshire Regiment).—Surg.-Capt. J. Harvey to be Surg.-Major, dated January 2, 1904.

4th (Donside Highland) Volunteer Battalion the Gordon Highlanders.—Surg.-Capt. J. O. Wilson, M.D., to be Surg.-Major, dated January 2, 1904.

1st (Inverness-shire Highland) Volunteer Battalion, the Queen's Own Cameron Highlanders.—Surg.-Lieut.-Col. (Lieut.-Col., retired, Indian Medical Service) T. R. Macdonald, M.B., resigns his Commission, dated January 2, 1904.

19th Middlesex (Bloomsbury).—William George Macfee, Gent., to be Surg.-Lieut. and to be borne as supernumerary whilst doing duty with the Bearer Company of the 5th London Volunteer Infantry Brigade, dated December 4, 1903.

1st Devonshire and Somersetshire Royal Engineers.—Surg.-Major G. B. Fraser to be Surg.-Lieut.-Col., dated January 6, 1904.

4th Volunteer Battalion the King's (Liverpool Regiment).—Surg.-Capt. R. Fielding-Ould, M.D., resigns his Commission, dated January 6, 1904.

1st Volunteer Battalion the Leicester Regiment.—Supernumerary Surg.-Capt. W. P. Peake, also commanding Leicester and Lincoln Volunteer Infantry Brigade Bearer Company, resigns his Commission, dated January 6, 1904.

4th Volunteer Battalion the Cheshire Regiment. Henry George Smeeth, M.D., to be Surg.-Lieut., dated January 6, 1904.

5th Volunteer Battalion the Cheshire Regiment.—Surg.-Lieut. E. J. W. Carruthers, M.D., to be Surg.-Capt., dated January 6, 1904.

1st Volunteer Battalion the Royal Welsh Fusiliers.—Capt. J. E. H. Davies, resigns his Commission, and is reappointed Surg.-Capt., dated January 2, 1904.

3rd (Duke of Connaught's Own) Volunteer Battalion the Hampshire Regiment. Surg.-Lieut. G. F. Morley to be Surg.-Capt., dated January 6, 1904.

19th Middlesex (Bloomsbury).—Surg.-Capt. W. N. Evans, from 1st Volunteer Battalion Middlesex Regiment, to be Surg.-Capt., and to be borne as super-

numerary whilst commanding the Bearer Company of the 5th London Volunteer Infantry Brigade, dated January 6, 1904.

Supernumerary Surg.-Capt. J. G. Fraser, M.B., commanding 5th London Volunteer Infantry Brigade Bearer Company, resigns his Commission, dated January 6, 1904.

4th Volunteer Battalion the Devonshire Regiment.—Surg.-Lieut. F. W. Kendle to be Surg.-Capt., dated January 9, 1904.

3rd (Cumberland) Volunteer Battalion the Border Regiment. — Captain H. Dodgson resigns his Commission, and is appointed Surg.-Lieut., dated January 9, 1904.

3rd (Duke of Connaught's Own) Volunteer Battalion the Hampshire Regiment. —Surg.-Lieut. C. H. Newby to be Surg.-Capt., dated January 9, 1904.

Surg.-Capt. C. H. Newby resigns his Commission, with permission to retain his rank and to wear the prescribed uniform, dated January 9, 1904.

VOLUNTEER INFANTRY BRIGADES.

Hampshire.—Surg.-Major E. J. Hunter, 3rd Volunteer Battalion Hampshire Regiment, to be Brig.-Surg.-Lieut.-Col. whilst holding the appointment of Senior Medical Officer to the Brigade, dated December 19, 1903.

Worcester and Warwick.—Major W. J. Whitcombe, commanding Brigade Bearer Company, to be Brig.-Surg.-Lieut.-Col. whilst holding the appointment of Senior Medical Officer to the Brigade, dated January 2, 1904.

Sussex and Kent.—Major J. Turton, Sussex and Kent Volunteer Infantry Brigade Bearer Company, to be Brig.-Surg.-Lieut.-Col. whilst holding the appointment of Senior Medical Officer, dated January 9, 1904.

VOLUNTEER INFANTRY BRIGADE BEARER COMPANIES.

East Surrey.—Surg.-Capt. (Honorary Captain in the Army) E. W. St. V. Ryan, from 16th Middlesex Volunteer Rifle Corps, to be Surg.-Capt., dated January 2, 1904.

5th London.—The announcement which appeared in the *London Gazette* of September 11 last, regarding the transfer of Surg.-Capt. W. N. Evans from 1st London Volunteer Infantry Brigade Bearer Company is cancelled.

ARRIVALS HOME.—From West Coast of Africa: Capts. P. J. Probyn, D.S.O., and R. L. Argles, Lieut. C. G. Thomson. From Canada: Major H. S. Peeke. From Bermuda: Capt. H. M. Nicholls. From Gibraltar: On leave, Lieut. E. E. Parkes.

POSTINGS.—Major R. J. Windle and Captain H. M. Nicholls to Ireland.

Major H. S. Peeke to Aldershot.

Major A. L. Borradaile to Western District.

Lieut.-Col. C. R. Tyrrell to South Eastern District.

Major D. M. O'Callaghan to Eastern District, instead of Southern, as given last month.

The following is the distribution of the class of Captains at the termination of the course at the College:—

C. G. Spencer, Ireland; D. J. Collins, Ireland; J. B. Anderson, S.E. District; A. E. Master, Western; G. Dansey Browning, Aldershot; E. S. Clark, Home District; C. K. Morgan, Scottish; J. P. Silver, Western; J. M. Buist, Woolwich; H. A. L. Howell, Thames; D. Lawson, Southern; E. B. Steel, Duke of York's School; H. E. Staddon, Salisbury Plain; S. J. C. P. Perry, Ireland; C. F. Wanhill, Netley; J. G. Berne, Aldershot; J. S. Gallie, Ireland; F. J. C. Heffernan, North Eastern; M. M. Rattray, S.E. District; J. H. Rivers, Egyptian Army—to rejoin; F. R. Buswell, F. A. Symons, K. M. Cameron, India; T. H. Goodwin, R. M. Academy—to rejoin; P. Evans, Guards—to rejoin; A. E. Milner, India—to rejoin.

The following is the distribution of the Lieuts. at termination of the Aldershot course:—

Woolwich: J. C. Lambert, B. G. Patch, J. E. Powell, T. J. Wright, F. J. Turner, E. M. Glanvill, W. F. Ellis. Ireland: O. Jevers, R. H. MacNicol, T. J. McEntire, N. D'E. Harvey, P. J. Hanafin. Netley: D. P. Watson, T. S. Dudding, S. L. Pallant, C. N. Bradley, H. H. J. Fawcett, M. C. Wetherell,

R. T. Collins, G. S. Mackay. Aldershot: F. W. W. Dawson, G. W. G Hughes, F. M. M. Ommanney, G. A. Kempthorne, J. E. Lewis, W. M. MacDowall, H. C. Hildreth, A. D. Richmond, F. M. G. Tulloch, W. D. Duguid, A. C. H. Gray.

Major R. C. Cottell, R.A.M.C., is holding a resident appointment at Queen Charlotte's Hospital, Marylebone Road, N.W.

EXCHANGE.—Major H. A. Cummins, C.M.G., and Capt. W. J. Taylor.

EMBARKATIONS. — India: Major J. Donaldson; Capts. L. A. Mitchell, D. E. Curme, and W. L. Steele; Lieuts. R. Storrs, J. Conway, N. D. Walker, H. A. Davidson, and J. McKenzie.

Major R. J. C. Cottell has been appointed to the charge of the Military Families' Hospital at Woolwich, in succession to Major H. A. Cummins, C.M.G.

Lieut.-Cols. E. L. Maunsell and W. Heffernan have been selected for increased pay.

The undernamed Capts. have been selected to attend the next course at the R.A.M. College:—

S. W. Sweetnam, W. S. Harrison, L. F. Smith, S. H. Fairrie, G. T. K. Maurice, J. V. Forrest, H. W. Grattan, J. H. Campbell, E. W. Bliss, J. C. B. Statham, E. C. Hayes, A. H. Waring, E. W. W. Cochrane, A. H. Morris, G. B. Riddick, A. J. MacDougall, R. W. Clements, M. Swabey, W. E. Hudleston, T. H. M. Clarke, E. W. P. V. Marriott, C. H. Hopkins, A. C. Lupton, E. A. Bourke.

NOTES FROM ALDERSHOT.—A lecture on Sanitary Appliances in Barracks with special regard to their care and maintenance in good condition, was given on November 26, in the Lecture Room, R.A.M.C. Depôt Training School, by Major Elkington, Sanitary Officer, to a large number of officers, W.O.'s, N.C.O.'s, and men of the Corps. After quoting Para. 340 King's Regulations and the duties of troops in barracks, laid down in the Regulations for R.E. Services, he proceeded to deal in detail with the appliances, illustrating them by means of lantern slides, describing the principles on which they act, and mentioning the best method of keeping them clean and in good sanitary condition.

This seems an excellent method of impressing the elementary principles of sanitation on officers and men; and it brought home vividly to all the responsibilities of Quartermasters and others concerned as to what they had to do both for the comfort and well-being of the men.

We hope during the winter to have lectures of a similar kind on water supply, ventilation, &c. The lecture was a novel and most important departure in the diffusion of sanitary knowledge of an eminently practical nature.

NOTES FROM JAMAICA.—Major Hassard writes: "The trooping season has commenced. Capt. Hodgens and nine men of the Corps are expected on the 10th in the "Dunera." Capt. Samman also joins the command. Lieut. Eyre Powell leaves about the end of this month for England. Capt. Hodgens proceeds to Newcastle, and Capt. Samman to Papine Camp. Evacuation of the Camp on account of the new drainage system has been fixed for January 1."

NOTES FROM SIERRA LEONE.—Major Pearse writes: "During the month. Capt. T. J. Crean, V.C., returned from leave and proceeded to Port Lokkoh, to take over medical charge there, in relief of Capt. P. J. Probyn, D.S.O., who had completed his tour of service on the coast, and has now gone home Capt. R. L. Argles has also left for England on the expiration of his tour here. He has been relieved by Capt. E. F. L'Estrange."

NOTES FROM MEERUT.—Lieut. Clarke writes: "At noon on the 13th, Sir Fredk. Treves came to Meerut. With the P.M.O., Col. J. F. Supple, and S.M.O., Lieut.-Col. A. W. P. Inman, he visited the Station Hospital and the Section Hospitals, cases of interest being pointed out by the M.O.'s in charge of them. He also visited the various stores, outbuildings, kitchens, &c., in connection with the hospitals. He took especial interest in the details connected with the native nursing establishment."

Col. W. E. Saunders, C.B., R.A.M.C., is appointed P.M.O. Meerut and Bundelkhand Districts, *vice* Col. J. F. Supple, R.A.M.C., who retires.

NOTES FROM THE PUNJAUB.—Capt. Birrell writes that Lieut.-Col. F. H. Treherne has been appointed to the command of the Station Hospital, Nowshera, and Major E. Davis to the command of the Station Hospital, Amritsar.

On arrival in India the undermentioned officers have been posted to stations noted against their respective names: Capt. W. G. Beyts, Umballa; Capt. N. Tyacke, Umballa; Capt. S. B. Smith, Mooltan.

Major J. H. Brannigan has been transferred from Amritsar to the Sirhind district.

The undermentioned officers left for England, tour expired on the dates noted against their respective names:—

Lieut.-Col. P. Mulvany, November 13, 1903; Lieut.-Col. C. R. Tyrrell, November 4, 1903; Major L. T. M. Nash, November 13, 1903; Major R. W. H. Jackson, November 4, 1903; Capt. G. B. Riddick, November 13, 1903.

Lieut.-Col. M. W. Kerin has been specially selected for increased pay from October 7, 1903, inclusive.

THE INDIAN ARMY ORDERS.—Army Headquarters, Simla, August 3, 1093. (4) Royal Army Medical Corps Examination. With reference to G.O.C.C. No. 307 of 1903, the undermentioned Officers of the Royal Army Medical Corps have passed the examination prescribed by the War Office to qualify for promotion to the rank of Lieut.-Col.:—

Majors R. R. H. Moore, M.D., A. E. Tate, G. F. Gubbin, J. Maher, C. W. Johnson, M.B., W. Turner, M.B.

India Army Order 191 *of* 1903. Army Bearer Corps-Appointment of Staff Officers. Military Department No. 4641—D, dated August 28, 1903. Para. 3, India Army Circulars, Clause 93 of 1902, is reconstructed as follows: "Each division will be placed under the Principal Medical Officer of the Command with a special staff officer taken from the medical services. As far as the interests of the service will permit these staff officers will be selected equally from the Royal Army Medical Corps and the Indian Medical Service, and in any case at least two of them must belong to the Indian Medical Service. They will supervise the administration, organisation and recruiting of the Corps, as well as assist the Principal Medical Officer of the Command in all matters connected with medical mobilisation arrangements."

Rawal Pindi, E. T. F. BIRRELL, *Capt. R.A.M.C.*,
November 6, 1903. *Personal Assistant to P.M.O. Punjab Command.*

CASUALTIES, &c., from December 11, 1903, to January 10, 1904, inclusive:—

Discharges.—"2nd Period": 5277 Sergt.-Major A. R. Titchener, December 20; "2nd period": 5291 2nd Cl. Staff-Sergt. D. Macauley, January 1; "purchase": 12207 Pte. F. Stott, December 11; "medically unfit": 18552 Pte. J. Connolly, December 15; "medically unfit": 11376 Pte. C. Turner, December 20; "medically unfit": 15628 Pte. G. Daveson, December 20; "medically unfit": 18366 Pte. E. Horton, December 22; "medically unfit": 15440 Pte. J. J. Dingenan, December 22; "medically unfit": 16147 Pte. T. Gooderson, December 22.

To Army Reserve.—11673 Corpl. J. Ruddell, December 21; 9565 Lce.-Corpl. P. Lane, December 11; 9912 Pte. W. S. Marshall, December 11; 12872 Pte. E. Wrigley, December 21; 14760 Pte. W. Blakeway, December 15; 9918 Pte. E. Campbell, December 21; 11905 Pte. J. Gizzy, December 20; 12094 Pte. D. Jones, December 29; 11451 Pte. C. Derrick, December 30; 10669 Pte. W. Croft, December 30; 14811 Pte. A. Maddocks, December 27.

Transfers.—9609 2nd Cl. Staff-Sergt. G. Cookson to S. Eastern Dist. Coy. Militia, December 19; 7857 2nd Cl. Staff-Sergt. R. Masters to S. Wales Vol. Infty. Brigade Bearer Coy., December 21; 5951 2nd Cl. Staff-Sergt. J. Ferrars to Gordon Vol. Infty. Brigade Bearer Coy., December 24.

Embarkations.—For Mauritius, per ss. "Assaye," December 22: 18910 Pte. R. Coggan, 17258 Pte. F. W. Pearce. For Egypt, per ss. "Golconda," December 12: 6365 Sergt.-Major H. B. Wall, 7236 Sergt.-Major C. B. Thompson,

9984 2nd Cl. Staff-Sergt. T. E. Cross, 8673 2nd Cl. Staff-Sergt. J. Halls, 16015 2nd Cl. Staff-Sergt. H. Kirton, 9763 2nd Cl. Staff-Sergt. E. J. Tilbury, 10871 Sergt. F. E. Bright, 11441 Sergt. H. Sprinks, 7415 Lce.-Sergt. W. Barratt, 10762 Corpl. C. H. Edwards, 10385 Corpl. T. Howe, 9438 Corpl. W. Coleman, 9578 Corpl. W. Dawson, 7646 Lce.-Corpl. H. J. Stapleton, 12939 Lce.-Corpl. R. Wale, 14958 Lce.-Corpl. H. Soady, 9381 Lce.-Corpl. C. E. Ross, 15176 Pte. T. Boyd, 17127 Pte. J. Fetlow, 18122 Pte. J. A. Kirby, 9735 Pte. J. A. Snell, 18044 Pte. A. Crowshaw, 18092 Pte. W. Lourigan, 17972 Pte. T. Burgess, 18207 Pte. F. C. Cousins, 17533 Pte. W. Cody, 18244 Pte. G. J. Cowie, 17894 Pte. G. R. Syvett, 18452 Pte. G. H. Stammers, 17433 Pte. A. Hirst. 17880 Pte. T. Richardson, 17590 Pte. V. G. Way, 18332 Pte. B. B. Bevan, 11195 Pte. J. Harris.

Disembarkations.—From Malta, ss. "Sardinia": December 13, 16250 Pte. T. Gettins. From Canada and Bermuda, ss. "Dominion," December 19: 11513 Corpl. G. Hinton, 12170 Pte. F. L. Dodd. From Malta on furlough: 10257 2nd Cl. Staff-Sergt. F. Higdon. From Malta, ss. "Rameses," January 9: 10929 2nd Cl. Staff-Sergt. E. H. Rossiter, 9066 Sergt. F. C. Miles, 9260 Corpl. A. Carhout, 11315 Pte. G. Austin. From Egypt, ss. "Rameses," January 9: 8782 Lce.-Sergt. G. Bennett, 11089 Lce.-Corpl. F. S. Flint, 11420 Pte. E. McCormack, 11077 Pte. C. Ward. From Barbados, R.M.S. "La Plata," January 1: 8879 Sergt. W. J. Wells, 9033 Sergt. A. Medwell, 10089 Sergt. S. C. R. Chester, 12522 Corpl. S. P. Gallie, 12107 Pte. A. E. Fenner, 12519 Pte. R. E. Halford, 13004 R. Leishman, 10109 Pte. E. J. H. Ratcliff. From Jamaica, ss. "Tagus," December 29: 12280 Corpl. A. Endacott, 11524 Pte. G. Martin, 11779 Pte. G. Neenan, 12191 Pte. W. A. Sweetman, 12510 Pte. F. J. Redwood, 12246 Pte. F. Kelling, 16877 Pte. E. MacColl, 12175 Pte. W. Murphy, 12150 Pte. H. Taylor.

EXAMINATION FOR PROMOTION.—The following Officers have passed in "Army Medical Organisation," "Sanitation and Epidemiology," and the "special subject" for promotion to Lieut.-Col.: Lieut.-Col. H. J. Wyatt; Majors R. J. Geddes, M.B., D.S.O.; J. M. Reid, M.D.; R. J. A. Durant; J. J. C. Donnet; H. M. Sloggett; J. R. Mallins, M.B.; Bt. Lieut.-Col. S. Hickson, M.B.; Majors C. H. Blackwell, M.D.; R. H. Hall, M D.; G. Cree; S. C. Philson; J. M. Nicolls, M.B.; C. A. Lane, M.B.; P. C. H. Gordon; M. O'Halloran, M.D.; F. J. Greig; H. D. Rowan, M.B.; H. Carr, M.D.; W. H. Starr; J. Kearney, M.D.; A. Kennedy; J. Will, M.B.; J. Fallon; A. W. Austin; D. M. Saunders, M.D.; J. Donaldson; H. B. Mathias, D.S.O.; F. R. Newland, M.B.; also Surg.-Major E. N. Sheldrake, Grenadier Guards, and Surg.-Major J. F. Bateson, M.B., Coldstream Guards.

The following Officers have passed in the subjects stated against their names: Major G. Wilson, M.B., "Sanitation and Epidemiology," and "special subject." Major J. J. C. Donnet, "Sanitation and Epidemiology." Major A. E. C. Spence, M.B., "Army Medical Organisation," and "special subject." Major M. L. Hearn, Army Medical Organisation," and "special subject." Major A. L. Borradaile, M.B., "Army Medical Organisation," and "Sanitation and Epidemiology."

The following officers have passed in Military Law: Lieut.-Col. H. J. Wyatt; Majors R. J. Geddes, M.B., D.S.O. (*D*); G. Wilson, M.B.; J. M. Reid, M.D.; R. J. A. Durant (*D*); J. J. C. Donnet; H. M. Sloggett; J. R. Mallins, M.B.; S. F. Freyer, M.B., C.M.G.; Bt. Lieut.-Col. M. W. Russell; Major M. L. Hearn; R. H. Hall, M.D.; S. C. Philson (*D*); J. M. Nicolls, M.B.; C. A. Lane, M.B.; P. C. H. Gordon; H. D. Rowan, M.B.; H. Carr, M.D.; W. H. Starr; J. Kearney, M.D.; F. A. Saw, M.B.; A. Kennedy (*D*); J. Fallon (*D*); H. W. Austen; J. Donaldson; H. B. Mathias, D.S.O.; F. S. Le Quesne, V.C. (*D*); C. Dalton; also Surg.-Major E. N. Sheldrake, Grenadier Guards.

AWARDS.—Capt. Robert Tilbury Brown, M.B., R.A.M.C., has been awarded the Gold Medal for his thesis for the Degree of M.D., University of Durham.

CORPS ORDERS by Surg.-Gen. Sir W. Taylor, M.B., K.C.B., K.H.P., Director-General, Commanding.

Headquarters, War Office,
January 12, 1904.

Promotions.

No. 1.—The following promotions, to complete establishment, will take effect from the dates specified :—

Lance-Sergeant to be Sergeant. Date of Casualty, 10.11.03.—11660 James, E., with seniority next above No. 9903 Sergt. R. T. Pack.

Lance-Sergeants to be Sergeants.—Date of Casualty, 17.11.03.—5443 Cross, H., on being posted to the Home District Coy. R.A.M.C. (Militia), for duty, in accordance with Para. 1,863 King's Regulations.

Lance-Sergeants to be Sergeants. Date of Casualty, 12.1.04.—7582 Miller, A.; 11272 Holmes, B.; 11603 Clegg, W.; 15598 Barnes, J.; 11843 Baxendale, J.; 14516 Barnes, C. H.; 10849 Richmond, C. E. T.; 10991 Pratt, E.; 11173 Hazell, C. J.; 11353 Lackey, M. E.; 15975 Harris, D.; 15892 O'Connor, J.; 10333 Martin, T.; 10892 Reeve, H. J.

Lance-Corporals to be Corporals. Date of Casualty, 12.1.04.—9377 Hurley, F.; 10959 Pitt, H. G.; 10830 Davidson, A.; 11089 Flint, F. S.; 10476 Speck, J. H.; 11090 Trueman, H. A.; 11320 Watts, R.; 11365 Cox, A. E.; 11563 Ward, E. J.; 11565 Jones, J. H.; 11728 Jarvis, T. J.; 12023 Morris, S. C.; 12266 Parker, H.; 12347 Martin, J.; 12441 Hubbard, L.; 12456 Crawford, R. F. W.; 12495 Brewer, T. H.; 12932 Gordon, C.

Appointments.

No. 2.—The following appointments to Lance Rank will take effect from the dates specified :—

Corporals to be Lance-Sergeants. Date of Casualty, 12.1.04.—11509 Earp, J. J.; 8532 Collins, H. G.; 10276 Bird, F.; 17234 Jones, W.; 10590 Elliott, J. W.; 11627 Secker, H.; 12280 Endacott, A.; 17901 Jones, G. I.; 11223 Hampton, J. F.

Privates to be Lance-Corporals. Date of Casualty, 12.1.04.—10626 Hubbert, H.; 10960 Harper, A. I.; 11370 Loveland, F.; 11403 Wagstaff, P.; 11577 Russell, D.; 11701 Marr, S. P.; 12466 Grogan, J.; 12819 Riches, W. H.; 12913 Plant, J.; 14123 Winn, H.; 14705 Muirhead, W. A.; 18662 Hepburn, A.; 14810 Colville, W. H.; 15996 Griffin, W. H.; 16301 Lane, E. A.; 16497 Rann, W. H.; 16524 Fandam, H.; 16573 Nichol, R. S.; 17159 Jones, C.; 17272 Thain, H. I.; 17928 Toye, W. S.

E. M. Wilson, D.A.D.G.,
Army Medical Service.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.—The following ladies have resigned their appointments :—

Sisters: Miss F. M. Hall, January 18, 1904; Miss E. T. Noble, R.R.C., December 17, 1903; Miss H. F. Pocock, February 7, 1904; Miss H. T. Young, January 28, 1904; Miss P. Young, December 16, 1903.

Staff-Nurses: Miss M. M. Rees, February 3, 1904; Miss L. F. A. Waller, December 13, 1903.

Appointed Matron: Miss A. L. Cox, posted to Woolwich.

Appointed Staff-Nurses: Miss C. Mackay, posted to Gosport: Miss E. Barber, posted to Connaught Hospital, Aldershot.

The undermentioned sisters and Staff-Nurses are confirmed in their appointments, their period of provisional service having expired :—

Sisters: Miss E. Beck, Miss R. Osborne, Miss A. B. Wohlmann.

Staff-Nurses: Miss S. B. Lanyon, Miss C. G. Stronach, Miss E. M. Denne.

Staff-Nurse: Miss S. B. Lanyon has returned to Hounslow from the Royal Military College, Sandhurst.

BIRTHS.

GRECH.—December 24, 1903, at 76, Lower Mount Street, Dublin, the wife of Capt. J. Grech, R.A.M.C., of a son.

SAW.—On December 24, at 13, Granada Road, Southsea, the wife of Major F. A. Saw, R.A.M.C., of a son.

SLAYTER.—On December 13, 1903, at 163, The Mall, Meerut, the wife of Capt. Slayter, R.A.M.C., of a daughter.

MARRIAGE.

HARDY—VAN BREDA.—On January 7, at Wynberg, Cape Town, Major W. Edmund Hardy, R.A.M.C., fourth son of the Rev. E. C. Hardy, to Florence Minnie, eldest daughter of S. Van Breda, of Hauptville, Wynberg, Cape Town.

DEATHS.

CREE.—Lieut.-Col. Edward Russell Cree, late Royal Army Medical Corps, died on December 29, 1903, at Pinewood Sanatorium, Wokingham, Berks, aged 45. He entered the Service in 1880, was promoted Surg.-Major in 1892, and Lieut.-Col. in 1900. He served on the West Coast of Africa, and in Egypt, India, South Africa, and Malta. His war services are as follows: Soudan Expedition, 1885—Suakin; actions at Hasheen and Tofrek; affair at Temai. Medal with two clasps; bronze star. South African War, 1899-1902.—Relief of Ladysmith, including operations of January 17 to 24, 1900, and action at Spion Kop; operations of February 5 to 7, 1900, and action at Vaal Kranz; operations on Tugela Heights (February 14 to 27, 1900), and action at Pieter's Hill: operations in Natal (March to June, 1900), including action at Laing's Nek (June 6 to 9); operations in the Transvaal, east of Pretoria (July to November 29, 1900); operations in Orange River Colony (May to November 29, 1900); P.M.O. of No. 1 Gen. Hosp. (October, 1901, to May 31, 1902); operations in the Transvaal, November 30, 1900, to September, 1901; operations in Orange River Colony, September and October, 1901; operations in Cape Colony, October, 1901, to May 31, 1902. Despatches (Sir R. H. Buller, March 30 and June 19, 1900), *London Gazette*, February 8, 1901. Queen's medal with six clasps; King's medal with two clasps.

JEPHSON.—Capt. Robert Dalkeith Jephson, Royal Army Medical Corps, died from gunshot wound, the result of an accident, on January 9, 1904, at Rawal Pindi, Punjab, aged 32. He entered the Service in 1897, and was promoted Capt. in 1900. His war services are as follows: Nile Expedition, 1898—Battle of Khartoum. Egyptian medal with clasp; medal South African War, 1899-1902—Relief of Ladysmith; operations in Natal, 1900. Queen's medal with six clasps; King's medal with two clasps.

WELLAND.—We regret to report the death of Lieut. Joseph Robateau Welland, Royal Army Medical Corps, who was one of the three officers killed in the engagement in Somaliland at Jidballi, on January 11, 1904. He was born in September, 1878, and was educated at Trinity College, Dublin, where he took the degrees of M.B. and B.Ch. in 1900, obtaining the degree of M.D. in 1902. He was also an M.A. of the University of Dublin and held the University certificate of proficiency in theory and practice of X-ray photography. He is stated to have been an excellent naturalist, and had made a name for himself in athletics at Trinity College during his career as a student. He joined the Royal Army Medical Corps in June, 1901, and at the Depôt and Training School, Aldershot, he obtained certificates in military law and interior economy, and in battalion, company, and ambulance drill. Since January, 1902, he has been seconded for service with the Somaliland Field Force, being attached to the 6th Battalion King's African Rifles. He was with the regiment during the previous operations against the Mullah; but had to be invalided last summer on account of malaria. He had only just returned to the seat of war, having left this country as recently as December 10 last. He was generally reported upon as a most promising young officer.

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Letters regarding subscriptions, non-delivery of the Journal, or change of address, should be sent to Major T. McCulloch, R.A.M.C., 68, Victoria Street, London, S.W.

Communications have been received from Surg.-Gen. Gubbins, Col. Fairland; Lieut.-Cols. Allport, Skinner, Deane; Majors Jevers, Edye, Peeke; Capts. Unwin, Fitzgerald, and Lawson.

In the event of reprints of articles being required by the authors, notification of such must be sent when submitting the papers. Reprints may be obtained at the following rates:—

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The following periodicals have been received: *The Medical Record, The Medical News, New York Medical Journal, Gazette Med. de Paris, Il Morgagni, The Medical Review, El Siglo Medico, Der Militärärzt, Deutsche Militäräztliche Zeitschrift, Anales de Sanidad Militar, Revue Med. de la Suisse Romande, La Medicina Militar Españolal The Boston Medical and Surgical Journal, Annali di Med. Navale, Giornale de, Regio Esercito, Le Caducee, The Hospital, The Ophthalmoscope, The Asylum News, St. Thomas's Hospital Gazette, Bulletin de l'Acad. de Med. de Paris, Arch. Med. Belges, Voyenno Medisinskii, The Indian Medical Gazette, The Australasian Medical Gazette, Journal of the Association of Military Surgeons, U.S.*

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Royal Army Medical Corps.

Original Communications.

PARA-TYPHOID INFECTIONS.

BY LIEUT.-COL. R. H. FIRTH.
Royal Army Medical Corps.

THE critical analysis by modern methods of cases of continued fever, clinically classified as being enterica, increases not only their interest, but adds to our doubts concerning the accuracy of prevailing views as to the entity of the disease, which appears so largely in our statistical returns as enteric fever. These doubts and difficulties have arisen from the occurrence of certain anomalous continued fever cases, which, though clinically resembling enteric fever in many of their features, have either failed to give the Grüber-Widal reaction or to yield an organism which could be recognised as the *B. typhosus*. In some cases both these negative features have been noted.

The first accurately described cases of this kind were those of Achard and Bensaude, reported in 1896, and which they called para-typhoid infections. Since then other cases of a similar nature have been described, and indifferently called para-typhoid or para-colon infections. Although these names are perhaps not the best that might have been chosen, they are now well established in medical literature; but for the sake of simplicity and as being clearly descriptive of the clinical

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state we prefer to use the term para-typhoid in this article. Widal and Nobecourt reported another case in 1897; in 1898 Brill and Gwyn both described further cases; Malherbe's, Mournier's and Cushing's cases followed in 1900. The latter is the most complete study in the literature of the subject. In August of the same year appeared Schottmüller's first case. In 1901 he reported five more cases clinically like enteric fever, but in whose blood Schottmüller found bacilli presenting characters intermediate between the true *B. typhosus* and the common colon bacillus. None of these cases gave the Grüber-Widal reaction for enteric fever. Later, Kurth gave a series of sixty-two highly suggestive cases; these have been followed by other analogous cases by Buxton and Coleman, also by Berg, Libman, Johnston, Allen, Hume and others.

If we take into consideration the care with which these cases, in which intermediate bacilli have been isolated (in many instances from the blood) and studied, it is difficult to deny that these micro-organisms are capable of causing a general infection that has to be seriously considered in the diagnosis of enteric fever. An analysis of the symptoms of the various reported cases and of some which have come under personal notice in India demonstrates that this so-called para-typhoid infection resembles closely true enterica, and may be even identical with it in clinical manifestations. Typical cases are portrayed in the following extracts. The two first are from notes of cases examined by me in 1899 at Rawal Pindi.

C. M., a bandsman of the Somerset Light Infantry, reported sick, complaining of headache and vomiting. Temperature on admission 103° F. Said he had been feeling ill for four days. Fever continued; no diarrhœa. Spleen noted to be enlarged and tender. Rose spots. Serum reaction tried twice against a stock culture of the *B. typhosus*, absolutely negative. Patient died on eighteenth day from pneumonia. At autopsy, made three hours after death, no ulcers of the intestine found. Peyer's glands were thickened and enlarged. Cultures from mesenteric glands negative, but those from the spleen gave no *B. typhosus*, but only a motile bacillus culturally intermediate between the common colon and the enteric bacillus.

J. L., a private in Rifle Brigade. On admission complained of headache, weakness and loss of appetite. The case ran a

course clinically resembling enteric fever, complicated with some pulmonary congestion. Rose spots noted, also enlarged spleen. Constipation marked. The serum reaction was negative to the *B. typhosus* when tried on three occasions, but positive to the organism isolated from C. M. at a dilution of 1 in 100, and to a stock atypical enteric bacillus at 1 in 80. Cultures from a single stool examined gave no enteric bacilli, but only the usual forms of colon bacilli. The patient recovered after an illness lasting seven weeks.

Gwyn's case can be briefly summarised thus: L. S., who had been feeling unwell since September 17, 1897, with fever, headache and weakness, and later with diarrhœa, vomiting and abdominal pain, was admitted to hospital on October 11. Within a week delirium and hæmorrhage from the bowel set in. Rose spots were noted, spleen enlarged, and the urine gave the diazo reaction. The blood serum was inactive against the enteric bacillus, but agglutinated at 1 in 200 an intermediate bacillus isolated from the patient's blood on October 12. This organism was not agglutinated by a powerful enteric serum. The man slowly recovered some five weeks later.

The following case is recorded by Allen (Case 2): M. E., male, aged 26. On June 6, 1902, complained of headache, fever and loss of appetite. Illness began two weeks before with headache, cough and coryza, followed by slight diarrhœa. When first seen was dull and listless, face flushed, tongue coated, moist and tremulous. Temperature 105° F. Pulse dicrotic. Abdomen soft and tender. Urine gave no diazo reaction. The disease ran a course of fairly typical mild enteric fever. A few rose spots were noted, and the spleen was always readily palpable. Leucocytes ranged from 6,000 to 9,000. Constipation marked. The serum reaction was frequently noted and always negative to *B. typhosus*. A blood culture taken on June 7 yielded an actively mobile rod which culturally was neither *B. typhosus* nor *B. coli*. On the seventeenth day cystitis supervened and from the urine a bacillus identical with that obtained from the blood was obtained. On twenty-first day thrombosis of the left femoral vein occurred. The subsequent course of the case was uneventful. Patient discharged on July 12.

So far as conclusions can be drawn from the cases reported

by others and those of apparently similar nature seen by myself, para-typhoid infections may be mild or severe as in genuine enterica.

The symptoms of invasion are practically the same, for we may find in both, lassitude, headache, anorexia, diarrhœa, epistaxis, chill followed by fever and some inflammation of the respiratory passages. During the course of the para-typhoid infection the patient developes the typhoid state, profound or slight, accompanied by tympanites, occasionally diarrhœa, but more often constipation, rose spots, splenic enlargement, and invariably a typical enteric fever temperature curve. For the most part the cases seem to be mild, ending in recovery, but a conspicuous feature of the group is the frequency of bronchitis, pneumonia, phlebitis and thrombosis, also suppurative conditions of various kinds. It is clear that the essential distinction between enteric fever and para-typhoid fever lies not so much in the symptomatology as in the difference of the infecting agent, therefore our main interest attaches to the bacteriology of the condition.

Owing to the incomplete description given by some of the writers on cases of para-typhoid infection, it is difficult to group their bacilli very satisfactorily; further, variations in the media used by them interfere to some extent in comparing the results. As previously stated, the presumably infecting bacilli are organisms intermediate in their characters between the true enteric bacillus and the common colon bacillus. As a rule, the micro-organisms resemble *B. typhosus* morphologically, being actively motile, multi-flagellate, free from spores, and not staining by Gram. When grown on agar and gelatine they also resemble the enteric organism, but in other media present striking differences. Thus, the intermediate bacilli always ferment dextrose (d-glucose) to the formation of both acid and gas; the enteric bacillus produces acid only. Neither the intermediate nor the *B. typhosus* decomposes lactose, which is always attacked by the colon bacillus. When cultivated in litmus milk the *B. typhosus* produces no change other than a permanent acidity; the intermediate bacilli produce usually a temporary acidity passing to a permanent alkalinity, but no clot; the colon bacillus produces both permanent acidity and clot. As regards the agglutination reactions, the serum of para-typhoid fever

cases either fails to react on the enteric bacillus altogether or does so in such low dilutions (1 in 20) and so slowly as to be virtually negative, but agglutinates the intermediate bacilli in such relatively high dilutions as 1 in 100 or 1 in 200. The main points of difference between the intermediates and the *B. coli* on the one hand and the *B. typhosus* on the other are well shown, as follows :—

	B. coli communis	The intermediates	*B. typhosus*
Agglutination by enteric serum	—	—	+
Fermentation of dextrose with gas	+	+	—
Fermentation of lactose with gas	+	—	—
Coagulation of milk	+	—	—
Production of indol	+	—	—

The foregoing bacteriological picture at once suggests a variety of micro-organisms which have been isolated by a number of observers and described by them under a variety of names. The earliest to be so described was the *B. enteritidis* of Gärtner, and for this reason Durham originally suggested that the intermediates of the enteric-colon group should be classified under the name "Gärtner and its allies." From the clinical standpoint, however, the name is hardly appropriate. The group further includes a number of similar organisms concerned in the etiology of meat poisoning, such as *B. morbificans bovis* of Basenau, *B. breslaviensis* of von Ermenghem, *B. Hatton* of Durham, as well as those described by Cotta, Fischer, Gunther, Karlinsky, Kaensche and others, also the *B. psittacosis* of Nocard, Gilbert and Fournier, the *B. icteroides* of Sanarelli, the *B. cholera suis* of Theobald Smith, the *B. typhi murium* of Löffler, the bacillus of calf septicæmia of Thomassen, the bacillus of Gwyn, the bacillus O of Cushing, the bacillus of Kurth, and a number of others variously named by Longcope, Libman and others. The bacillus isolated from C. M., in India, belonged to this category.

It is clear that the intermediate group is a fairly large one, presenting certain common cultural features, but, from the point of view of their pathogenicity, its members can be divided in the following manner.

(*a*) The meat-poisoning bacilli, as represented by the organisms of Gärtner, Basenau, Durham, Fischer, Cotta, Bowes, Ashton and others. These are associated with the sudden onset of symptoms suggestive of toxin poisoning, following the ingestion of tainted meat. The duration of the illness is usually about five days, followed by recovery, but not infrequently runs a rapid course resulting in death. The outbreak at Derby, investigated by Delepine, was an instance of infection by a bacillus of this kind; the micro-organism is sometimes referred to as the Derby bacillus.

(*b*) The pneumonic bacilli, as represented by *B. psittacosis*, which gave rise to a disease in parrots and to an obscure epidemic of pneumonia in man, as reported by Nocard, Achard and others.

(*c*) Those apparently non-pathogenic to man, as represented by Smith's *B. choleræ suis* and Lœffler's *B. typhi murium*.

(*d*) Those causing enteric-like symptoms in man, and represented by *B. Gwyn*, the bacillus O and many others isolated and described by a variety of observers in Europe, Asia and America. These micro-organisms appear to be the true para-typhoid bacilli, inasmuch as they are associated with a typhoidal state in man, and if the term para-typhoid is to be retained, it seems better to limit its use to these micro-organisms, as being clearly suggestive of the clinical state with which they are associated.

This is practically the view adopted by Buxton, whose work upon the intermediate group is probably the most complete up to the present time. He further suggests that the term para-colon might and should be used to indicate the other members of the intermediate group, that is, embrace only those which do not cause typhoidal symptoms in man, and thereby include the meat-poisoning and psittacosis bacilli, together with those which are not pathogenic to man, such as *B. typhi murium* and the hog cholera bacillus.

When the para-typhoids (*i.e.*, sub-group *d* in the above classification) are more closely studied, they are found to present certain minor cultural differences among themselves, but these differences are by no means sufficient to constitute distinct species or even varieties. Here again we are largely indebted to Buxton's researches; he breaks up the para-typhoid bacilli

into two broad classes, *a* and *b*. In *a* he places those which produce little gas in dextrose and render milk permanently acid; further, although they change neutral-red to yellow, the magenta colour returns after three weeks or so. In *b*, gas production in dextrose is very free, milk is rendered permanently alkaline after a transient acidity, and in neutral-red the yellow colour is permanent. Culturally, it is evident that class *a* stands nearer to the true enteric bacillus than does class *b*. In the case of C. M., previously mentioned, the neutral-red reaction was not then available, but, by virtue of the behaviour of the isolated organism in dextrose and milk it belonged to class *a*. It is regrettable that any subdivision of the para-typhoid bacilli should have been found necessary, but it is not improbable that, as observations upon this class of infection become more numerous and exact, the incriminated organism will be found to conform to a single type. It is precisely on this point that we need further facts.

Three questions arise out of these considerations, they are: (1) Can the para-typhoid bacilli be regarded as constituting a distinct species? (2) May not these so-called para-typhoid cases be explained on a theory of mixed infection? (3) What bearing have the facts upon our work in the Army?

Experiments and agglutination results alone can help us to decide the first question. It must be admitted that the earlier work on this subject does not point altogether to an affirmative answer, but it must be borne in mind that at that time all the members of the intermediate group of the enteric-colon family were regarded as identical, and that the distinctions on the basis of their pathogenicity was not appreciated. Buxton's elaborate work, however, shows that members of the para-typhoid species or those producing typhoidal symptoms in man, while not generally affected by sera resulting from immunisation by members of what has been defined in this article as the para-colon species, interact freely with homologous sera, in fact, quite as readily as various strains of the enteric bacillus would be likely to do with enteric sera. A large number of further observations on this point are desirable, but the weight of evidence so far suggests the conclusion that in the para-typhoids we are dealing with a distinct species, the members of which are indistinguishable from each other, either culturally or by

agglutination tests, and are capable of causing symptoms in man closely resembling enteric fever.

That there might be a secondary or mixed infection in enteric fever by members of the colon group was considered long before the para-typhoid species was differentiated. The writings of Welch, Widal, Péré, Chantemesse, Stern, Cabot and others are full of the idea. It is not difficult to understand the possibility in fevers, with intestinal lesions, of invasions by way of the portal circulation. But a critical survey of the literature and one's own experiences make it doubtful whether the existence of such mixed infection deserves serious consideration. It may be proved in the future, but up to the present the evidence in support of it is singularly unsatisfactory.

The influence which these facts regarding para-typhoid infections should have upon our work in the Army is clear, and attention was drawn to it in the "Report of the Army Medical Department for 1901" (p. 356). The detection and bacteriological observation of cases of the kind, especially in India and South Africa, offers a large and promising field of work for officers of the Corps. The line of enquiry should embrace not only exact identification of micro-organisms, recoverable immediately after death in all cases of continued fever, but serum reactions of the patient during life against typical enteric bacilli, typical colon bacilli, and intermediate bacilli. At the same time, when the circumstances permit, the search should be made during life for bacilli in the spleen and blood stream, and precise identification established of any bacteria found. As compared with a bacteriological examination of the fæces or of the rose spots, cultures made from puncture of the spleen or from the blood have distinct advantages. The technique for direct blood examinations is briefly as follows: The front of the arm must be carefully washed with soap and water, then with ether, and lastly with bichloride of mercury solution 1 in 1,000. The bichloride is then removed carefully by means of sterile swabs of cotton-wool soaked in sterile water, and 10 cc. or more of blood removed by inserting the sterile needle from a sterile syringe into a superficial vein. The contents of the syringe are quickly passed into a series of tubes each containing 10 cc. of sterile nutrient broth. About 2 cc. of blood should be added to each tube of broth. The whole are

incubated at 37° C. for twenty-four hours, and from any in which a growth or turbidity has occurred platings, either in gelatine or on neutral litmus lactose agar, made. Provided elementary care as to antisepsis be observed, this method presents no risks to the patient incommensurate with its diagnostic value. Given a series of careful observations on doubtful and undoubted cases of enterica, we should be not only able to verify our statistics of enteric fever, but by the collection of observed facts and examination of isolated organisms clear up many obscure points in respect of etiology, diagnosis and prophylaxis. On no other lines can this question of the entity of the continued fevers of the enteric type be elucidated, and probably few men have greater opportunities of observing these cases than officers of the Corps. In putting forward this suggestion for clinical research, I need hardly say that we who are working in the College labaratories will be only too glad to receive cultures for experimental control observations.

For the help of those desirous of looking up the literature of this subject, the following bibliography is appended.

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A SKETCH OF THE MEDICAL GEOLOGY OF SOUTH AFRICA.

By Lieut.-Col. Bruce Skinner.
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Part I.

South Africa has for many years past been of such importance politically that its position has become one distinct in many ways from the positions held by the numerous states, native kingdoms, and races of men possessing other divisions of the dark continent. South of the Zambesi, and more emphatically south of the Limpopo, the country is almost a European one, and for this reason is on a different footing to the rest of Africa. The recent war brought home to us the European character of the political and military organisations of the Boer Republics; but more recent events are impressing the conviction that these countries cannot be populated entirely by white races. The white races govern and protect; the coloured races are necessary to carry out the manual labour.

Apart, however, from the political aspect, South Africa forms an integral part of a great continent which, looked at broadly, presents a series of dried-up inland seas, represented by the Kalahari Desert, the Congo basin, the Sahara, and the Libyan Desert,* bound in on the east by the great divide running from north to south of the continent between 30° and 40° of east longitude, and on the west by the coastal highlands. The eastern series of mountains is continued southwards to the Drakensberg; the western highlands follow the coast to the southern Cape, and are then reflected eastwards to meet the former.

This eastward reflection is divided roughly into three series, each of which forms a step upwards from the southern coast to the plateau country of the interior. The southernmost varies from 3,000 to 5,000 feet in height, and runs from east to west under varying names at no great distance from the sea. North

* These are well shown in a map published in H. Drummond's "Tropical Africa."

of this range comes the Little Karroo (or desert), commonly known as a plateau, but varying in elevation from 4,000 feet to as little as 1,000 feet, where it has been scarped out by the affluents of the river emptying into the southern ocean under the name of the Gourlitz.

North of the Little Karroo is a second range, approximately parallel to the former, running into the sea at its eastern, reflected northwards at its western, extremity. This series of hills, reaching an elevation of some 7,000 feet, is, like the former range, known by names which vary with the localities through which it extends. It is cut through by southward-flowing rivers, whose denuding action has in places lowered the chain to less than 1,000 feet.

The Great Karroo lies north of this series, a greater expanse of desert than the Little Karroo, and one which the early histories of the country show to have been a formidable obstacle to those settlers on the coast who attempted to travel northwards. The Great Karroo is backed by lofty ranges culminating in the Compass Berg, a mountain 8,500 feet in height. As with the other ranges, this range is distinguished in different localities by varying names—the Roggeveld Mountains, the Nieuwveld Mountains, the Sneeuw Bergen, Tandtjies Bergen, and the Groot Winterbergen. The two latter extend eastwards to the sea, escarped by southward-flowing rivers. The Zuur Bergen are continued eastward into the Stormbergen; the Stormbergen turn northwards into the Quathlamba Mountains, or Drakensbergen.

North of the third range comes the country known as the "veldt"* rolling downs broken by more abrupt elevations, and worn down into valleys by river action; but on the whole presenting a vast expanse of undulating country some 4,000 feet above sea-level, extending northwards through the Orange River Colony to the east of Pretoria, broken indeed, but giving a general impression of sameness, especially to the new-comer.

The third range, though its south-eastward extension is cut through by southward-flowing rivers, forms with its north-eastward branch the divide of Cape Colony. The aspect of

* The veldt is in some parts known as High Veldt, in others as Bush, or as Baken Veldt; while in places local names, as Nieuw Veldt, Winter Veldt, are given.

to-day is the resultant of a long age of denudation; this aspect now presents a series of rivers flowing southwards from its southern slopes to discharge into the Indian Ocean; while from its northern faces the waters flowing across the "Veldt" join the Orange River.

The table-land comprised in the term "veldt" is broken on the west by mountain ranges known as the Karree Bergen and Herzog's Rand. The last-named trends northwards across

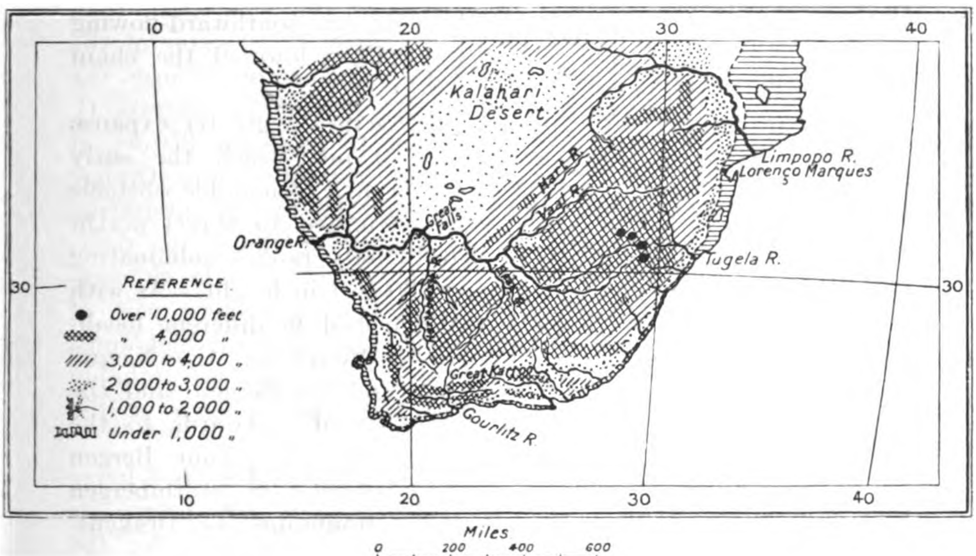

Fig. 1.—Orographic plan to illustrate the drainage of South Africa. Inside of the 1,000 ft. limit is a narrow strip of 1,000 to 2,000 ft. country, which is not clearly shown on the diagram.

the modern track of the Orange River into Griqualand West. Westward of these ranges Great Bushman's land repeats the plateau formation of the veldt until the coastal highlands are reached. This plateau formation descends towards the Orange River, being at its western part deeply channelled by river action (see diagram 1).

Between East Griqualand, Natal, Zululand, and the Portuguese territory of Lorenço Marques on the east, and the Orange River Colony with the Transvaal on the west, is the Drakensberg. This range forms the great divide of the country. The

streams from its eastern face flow into the Indian Ocean, the greater volume of rainfall on this side having produced more rapid denudation, and consequently a more steep descent to the sea from a range which rises as high as 12,000 feet. Those from the western side flow ultimately into the Orange River, with the exception of those at its northern end.

The northern portion of the divide in the Transvaal empties its western streams into the Limpopo. This river, flowing at first northwards, takes later an eastern bend, cuts through the Drakensberg at the northern boundary of the Transvaal, then taking a southward turn receives the eastern flood water of the northern portions of those mountains, and empties near the port of Lorenço Marques into the Indian Ocean (see diagram 1).

It is beyond the scope of this paper to trace the history of the rivers of this vast country. The history of the Orange River and its affluents would afford material for an interesting volume. A brief summary of the history of the latter river, indicating the vicissitudes of the country, will include an east-ward-flowing river following the track of the western part of the Orange draining the eastern slope of the coastal highlands, and emptying into the Kalahari quondam sea. This sea probably once extended to the south of the tract now known as the Kalahari Desert.

This western river in the process of time eroded its bed lower than the silted sea-bed of the Kalahari, but not before its sources in the western highlands had been captured by the stream flowing seawards from these heights. Its stream then became reversed, with the result that it drained off the water from the Kalahari sea.

Another constituent of the modern Orange was a northward-flowing river extending from Upington to Prieska, receiving the drainage of the Winterveld along the beds of the Hartebeeste and the Brak Rivers, though it is probable that the Hartebeeste formed a separate line of drainage into the Kalahari. In the neighbourhood of the Aughrabies Falls this river joined the western, instead of pouring into the Kalahari, as at first, thus completing the robbery of the sea, which, deprived of its water supply, and already silting up, became the modern Kalahari Desert.

Other westward-flowing streams from the Asbestos and

Kuruman Hills emptied directly into this sea, and are now lost in its sands. But the eastern part of the Orange, as well as the Vaal and the Harts, poured their waters into a depression to the east of the Asbestos range at a period before the silting up of this depression led to the more intimate union of these streams, and their absorption into the Orange. The strongest stream absorbed the waters of the lesser, and was itself absorbed by the river mentioned above as flowing northwards from Prieska.

The Kalahari Desert presents still the tracks of its northern and western streams, whose waters, once flowing into its sea, found their way later across its silted-up sandy bed with decreasing force, and now disappear into its sands, beneath which they may still be traced. The formation of the Kalahari Desert was not, however, entirely due to mere filling up of the sea-bed; it was doubtless partially due also to diminution in the South Africa rainfall.

Judging by the fossil flora and the coal-beds of South Africa, there must have been a period when the precipitation largely exceeded that which occurs in the present day. Whatever may have been the physical conditions which formerly produced moisture, those of to-day are inimical to any but a modicum of rainfall. Rain as we know is brought to a land by the moisture-laden air above the sea meeting a colder medium when it strikes the land. On the western coast of the Atlantic, currents travelling up from Antarctic regions bring with them no moisture to deposit on the land. On the Eastern coast the warm currents of the Indian Ocean deposit their moisture on a portion of the coast north of the country now being considered, with the result that though Zululand and Natal are better off than the rest of South Africa, their rainfall is never excessive. Very little of this fall crosses the high ridge of the Drakensberg. On the country west of these mountains the rainfall rarely exceeds 30 inches in some favoured localities, while in others it falls to 5 inches, or even less. The result is bare hills, from which the flood water rushes precipitately into the rivers, producing temporary torrents discharging rapidly into the sea. There is not sufficient soil to stay the fallen rain; and modern man has not, except in a few isolated instances, made any effort to retain the moisture by artificial means, as

appears to have been done in the past by the people who once inhabited Mashonaland.

The watershed of a country is an index of the contouring of the rocks (see fig. 5). More than that, it becomes a guide to the physical history of the country. The outflow of the drainage has produced the general features of the land it flows through; but its action is complex, for it not only carries away the hills, and carves out the valleys (see figs. 2, 3, and 4), but it produces conditions which have opposite effects. The water of the rivers laden with detritus comes at last to positions where it can no

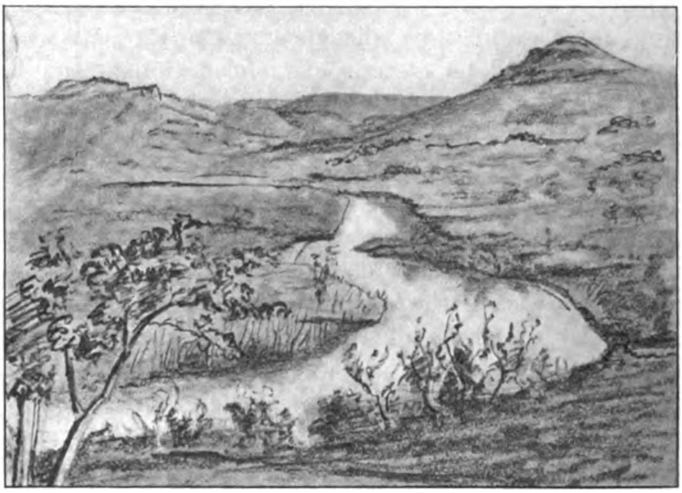

FIG. 4.—The Klip River, showing the alluvial flat formed by the river on the left of the sketch. The country is formed of shales, which the river is slowly eroding on the right. (From a photograph.)

longer carry its load. The load is then deposited, and new land surfaces are formed. The new land surfaces in their turn modify the courses of the water. These conditions we have glanced at above when speaking of the Orange River; but we have to constantly bear them in mind when travelling through a country. In one locality we see a river rushing past bare hillsides between rocky banks; in another the same river winds through alluvial flats, which have been deposited in marsh or lake at some previous period of its history.

Deposition of its load is not only carried out by a stream

FIG. 2.—A Valley of Erosion produced by the River Umgeni, Natal. The photograph speaks for itself as illustrating the erosive work done by the river, whose bed has been carved out of the mass of rock through which it flows.

FIG. 3.—Howick Falls, the head-waters of the Umgeni, falling 365 feet over the edge of the table-land which acts as the collecting ground. The fall cuts back the table-land (at a rate not yet estimated). The velocity acquired by the water scours out the *débris* constantly pouring into the stream-bed from the sloping talus shown in the former illustration. (From photographs taken by Mrs. David Bruce, R.R.C.)

when it discharges into the sea or into a lake; it may, and does, occur at many points along its course. Any physical character which retards the flow of a stream induces deposit;

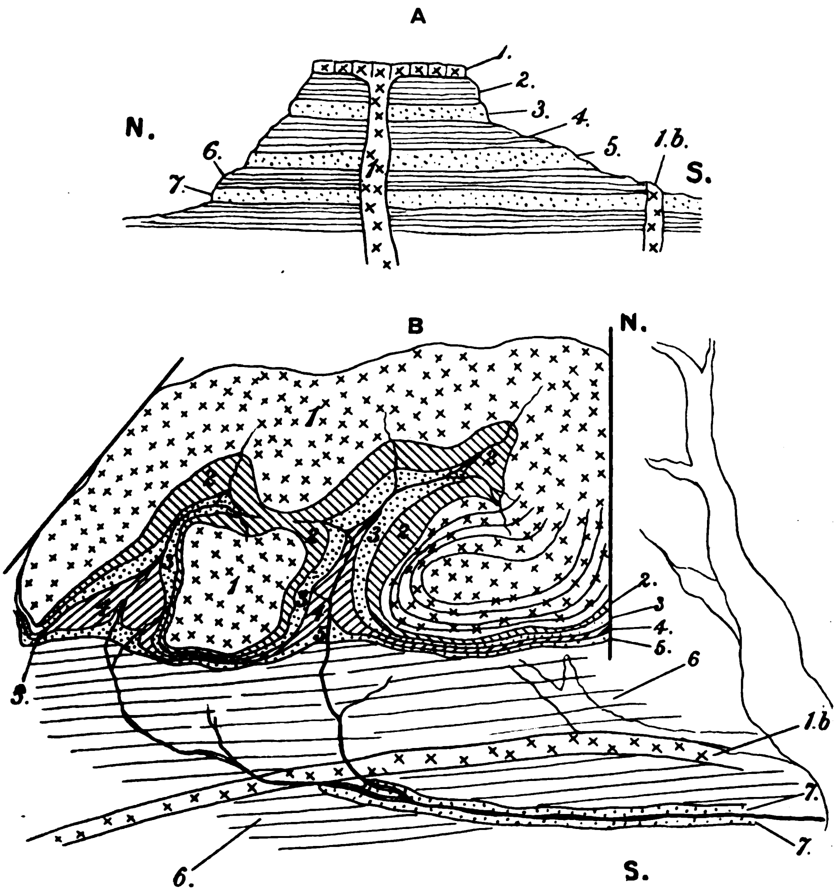

FIG. 5.

A.—Diagrammatic section through the hill immediately south of Tempé Farm, near Bloemfontein.

B.—Block plan of A, with 10-foot contours, showing how erosion by water has laid bare the successive strata during the process of stream formation.

1, Cap of diabase; in A above, a diabase pipe runs at right angles to the cap; 1*b*, dyke of diabase; 2, 4, 6, Mudstones; 3, 5, 7, sandstones.

and, conversely, any cause which induces increased rapidity of flow will carry away deposit. The work done by increased rapidity of flow of stream water is such that when velocity

18

is doubled the amount of sediment carried is multiplied to the sixth. This is shown, practically, by the subjoined table.

TABLE SHOWING TRANSPORTING POWER OF WATER.

Velocity of Current	Size of Material Moved
3 in. per second	Moves fine clay and silt.
6 in. "	" fine sand
12 in. "	" pebbles ½ in. in diameter.
2 ft. "	" " 1 in. "
2·82 ft. "	" " 2 in. "
3·46 ft. "	" " 3 in. "
4 ft. "	" " 4 in. "
4·47 ft. "	" " 5 in. "
4·9 ft. "	" " 6 in. "
5·29 ft. "	" " 7 in. "
5·65 ft. "	" " 8 in. "
6 ft. "	" " 9 in. "

Quoted by Prof. J. C. Russell in "River Development," p. 18.

Thus, other things being equal, *i.e.*, the sediment supplied remaining constant, the sinking of a land will cause deposit in a stream because its fall is lessened; rising of a land will increase the fall of a stream and hasten erosion. In the former case the flow of water is slackened, in the latter it is hastened: this is apart from any tilting of the stream-bed. But if the sediment supplied is a variable quantity, as may happen in a territory with an increasing rainfall, the final result will still depend upon the bottom velocity of the river. For if the physical configuration will allow of the rainfall increasing the velocity more detritus will be carried away; but if the velocity of the river is not increased, an increased amount of detritus will be deposited as soon as the surface drainage finds its way into the stream.

Thus it will be understood that rain falling on a much disintegrated rock surface with a steep fall towards the river will carry down much mud, and may add much velocity to the stream; but unless the velocity is increased in the main stream in relation to the load supplied, a proportion of the load will be deposited in the river-bed. Again, a scanty rainfall in a sandy country will not add appreciable volume to the stream, while the wind will blow dust into the waters, and thus increase the load without adding to the velocity.

An old river will have cut down its channel to sea-level, and have silted up its mouth, and have silted up all those parts behind places where physical bars have delayed erosion, and thus will have produced conditions analogous to those of a sinking land. Subsequent elevation of the land will see the same river carve a deep channel through territories produced at a previous epoch by its own action, even though the rainfall be diminished (within limits). These facts, frequently seen in other lands, are marked in South Africa. This last-mentioned condition of the rivers is so evident in this country as to justify the presumption that the land is still being elevated.

In the parts now under consideration we see alluvial flats formed at a past period now channelled by the modern stream in such manner as to present steep banks, one side of which usually consists of the old river deposit, the other of the harder bed-rock. As a guide to the bank of a stream which may be expected to show erosion, it may be stated that in the Southern Hemisphere streams flowing north or south erode their left banks, leaving alluvial deposit on the right; this may be accepted as a broad definition, modified only by the presence of physical obstacles, which may cause local deviations from this rule.

This effect is due to the speed of rotation of the earth becoming less from the Equator towards the Pole. This rotation has a different effect on east and west flowing rivers. Those flowing east flow with the force of gravity measured by their fall, plus the rotation impetus of the earth's movement, minus the tendency of a liquid body to be "left." Those flowing westwards travel with their gravitational force plus the tendency of a liquid body to be left by the earth's eastward rotation minus the rotation impetus of the earth.

In connection with this must be taken the fact of the invading action of the sea on the east coast of South Africa due to the eastward rotation, and the receding action of the sea on the west coast due to the same cause. The east coast deepens rapidly owing to erosion by the above cause; but the mouths of the rivers silt up because this action hinders the discharge of river mud into the ocean bed before it can reach the sweeping action of the Mozambique current southwards.

The sea off the western coast is more shallow, owing its

loss of scouring force to its being unable to keep pace with the earth's rotation, sediment therefore accumulating off the coast; while westward-flowing rivers deposit their load after it has been carried into the sea.

These conditions, occurring under our eyes, give the key to the geological past of South Africa, a land whose rocks consist of sand and mud formed in silted-up rivers and lakes, and occasionally in shallow seas, varied, however, by volcanic material which has burst up from below the outer crust.

The earth is perpetually being reconstructed out of the materials of its decay. It is remodelled out of the wreckage of its past. But as we live upon the rocks of the past, and as these influence our occupations, our habits, our food and our water supply, a sketch of the past history of the parts of South Africa recently traversed by our armies is necessary to understand the modern conditions of the country.* The form of the ground, the special features of the country, the conditions of water supply, become clearly intelligible when the structure and disposition of the older rocks are known to the observer.

Geology.—Without entering more technically than is absolutely necessary into the geology of our portion of South Africa, the following summary points out the characteristics of the rocks encountered, the numerals indicating the succession upwards of the various classes of rocks, No. 1 having been deposited first. (See Table.)

The general history of the above rocks may be sketched as follows. First occurred the period of deposition of the series marked I., followed by its disturbance by intrusive granite. Second, a period during which series II. was deposited. This period was followed by elevation and distortion of the rocks composing II. Third, a period of subsidence, during which series III. was deposited. This series was subsequently raised and distorted, the distortion being most marked in the south. dying out northwards until the northern margin of the central

* This is as true of the earth as it is of nations, for no man can understand a people without a knowledge of the general history of mankind. The history of the past indicates the main lines of the history of the future, while illustrating the conditions of the present.

	Names given to Groups of Strata		General Characters of Rocks	Age in Terms of English Rocks
IV.	9. Stormberg Beds	iv. Volcanic*	A trap rock commonly known as dolerite	
		iii. Cave Sandstone	Massive fine-grained sandstone, containing remains of fish	Post-Triassic
		ii. Red Beds	Red Sandstones	Triassic (Rhaetic)
		i. Molteno Beds	Sandstones, grits, and sandstone-conglomerate with large boulders; thin bands of dark shales; coal beds (lacustrine)	,, ,,
	8. Karroo Beds		Shales, red, green, purple, buff (marine muds). Thin-bedded sandstones, soft and fine-grained	,,
	7. Kimberley Shales ..		Chiefly grey and dark mudstones, with lenticular laminæ of coal. (estuarine and fluviatile muds)	,,
III.	6. Ecca Beds		Non-laminated and sandy clays, generally known as mudstones; quartzose sandstones	Perhaps Permian, or Permo-carboniferous†
	5. Dwyka Conglomerate..		A hard grey rock containing embedded fragments, sometimes rounded, sometimes angular, of variable sizes. By some attributed to ice action, by others looked upon as a volcanic breccia	Ditto
II.	4. South. Quartzites of the Wittebergen		Quartzites, sometimes massive; sandstones and shales	Carboniferous
	North. Pretoria series		Ditto	,,
	3. South. Bokkeveldt Beds North. Dolomites		In the south, slates and sandstones; in the north, dolomitic limestones, sandstones, and slates	Devonian
	2. South. Table Mountain Sandstone North. Black reef series		Massive grits, with slates, sandstones, and conglomerates	Pre-Devonian
I.	1. The Primary system, including the Malmesbury Beds of the south, and the auriferous conglomerates (Witwatersrand and Barberton) of the north		Granite, gneiss, and schists; sandstones and intrusive dykes and sheets of diabase	,,

* This series will in time be placed in a separate category. Following the numbering here given, it will be shown as V.
† See *Nature*, November 26, 1903, p. 91.

Note.—The above table has been compiled chiefly from Prof. Green's paper on the "Geology and Physical Geography of the Cape Colony," contained in *Quart. Journ. Geol. Soc.*, vol. xliv., part 2, as this appears to the writer to give the most lucid summary obtainable of the geology of this country.

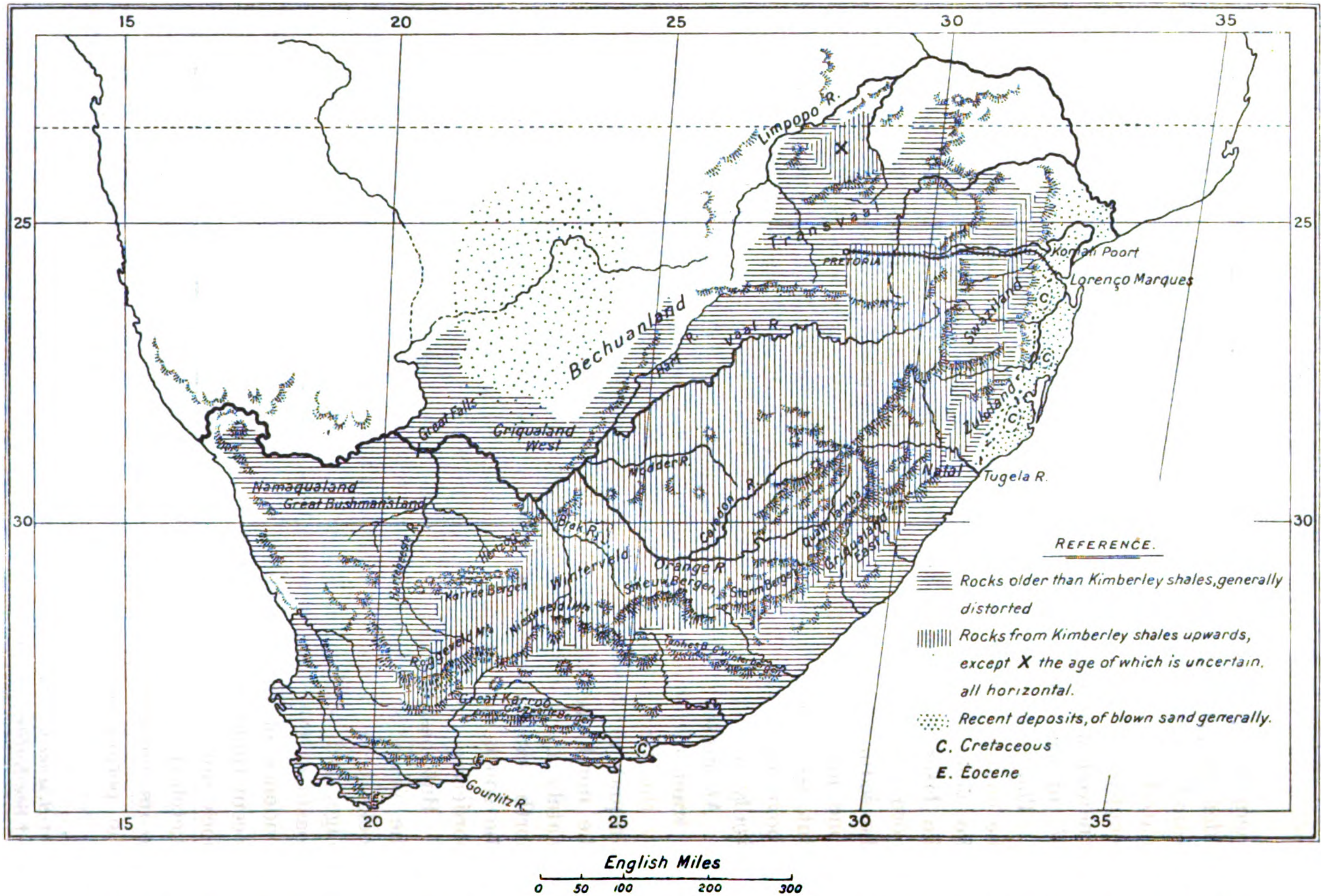

Fig. 6.—Plan to illustrate the surface geology of South Africa, showing areas of horizontal as distinct from distorted rocks.

basin is reached, when the distortion is again marked. The older amygdaloidal traps do not seem to be later than this period. Fourth, a period during which the depression (accentuated by the marginal elevation and distortion last noted) occupying the centre of the country became the seat of renewed deposition. This deposit constitutes the series marked IV. in the table.

The next stage in the history was the gradual elevation of the country, which may perhaps be dated as commencing before the volcanic series (the diabase of the modern hill-tops and the later series of dykes) was formed. It would probably be more strictly accurate to mark the volcanic series as V., as the sedimentary rocks immediately below this series had undergone much denudation before the lava sheet was poured out.* But so even and gradual was the elevation that the rocks above the Ecca beds have maintained their horizontality practically undisturbed.

At present the general surface distribution of series IV. is a tract of country bounded at the present day in the south by the Great Karroo, on the west by Great Bushman's Land, Griqualand West, Bechuanaland and the Western Transvaal, on the north by the Western Transvaal and by the line approximately marked by the Pretoria-Koomati Poort Railway. The north extremity of its eastern side is bounded by Swaziland, the southern extremity extends to the belt of Palæozoic rocks bordering the Indian Ocean in Natal (see fig. 6).

But besides the formations noted above, the country near the sea-coast shows rocks of more recent origin, Cretaceous rocks being found in Zululand and Natal, Wealden† at Uitenhage, and tertiary and recent strata on the south and western coasts as high as 200 feet above sea-level. These formations are evidence of the continued rise of this continent up to at least recent times. Whether the upward movement is still progressing does not appear to be certain, though the physical condition sketched above when describing the river system would point to its continuance. This will become further demonstrable when the period since accurate measurements and observations have

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* *Science Gossip*, vol. vii., No. 77, p. 135.

† See *Nature*, October 22, 1903, p. 613, and November 26, 1903, p. 91 (R. L.).

been made has been extended. At the same time it may be remarked that a table published in the *Quarterly Journal of the Geological Society*, vol. xxvii. (1871), p. 548, gives the altitude of "the flat around Bloemfontein" as 5,300 feet, elevation taken by Mr. J. Graham, of Aliwal, and quoted by Stow; while the maps of to-day show the railway station at that town to be 4,517 feet. The former measurement places the lower ground about Bloemfontein at a higher level than the highest hill-top of that locality now attains (Naval Hill, about 4,900 feet). But the accuracy of the measurement may be doubted owing to the vagueness conveyed by the term "flat around Bloemfontein"—those who know the locality will recognise that flatness is a comparative term. There is a comparatively flat spot to the west of the town, and another to the east. Between the two there is a fall of some 50 feet or more, while both "flats" slope eastwards.

These "flats" require mention as presenting a feature of the geology of South Africa which does not appear to have been sufficiently appreciated by the settlers of that country, at any rate in the northern countries. The rocks of which the country is built up have been eroded; their disintegrated material has been washed down to lower levels, and carried by flowing water as described above, until some physical obstacle has diminished the carrying power of the stream. The disintegrated material, to be described later under the head of soils, has then been deposited in horizontal layers up to the level of the top of the physical obstacle. Later, the waters have worn a channel through the obstacle in many cases; and, subsequently, cutting backwards, have eroded a channel through the alluvial flat (see diagram of Vet River, fig. 11, second part, and country west of Bloemfontein, fig. 8).

Such localities occurring in India would present a series of carefully-planned terraces, extending from the valleys up as high as such parts of the hills as were not too steep to allow of such a procedure. The water would not be able to escape in the headlong manner now prevailing, the soil would be retained, and the country would produce at least sufficient crops to feed the population; while the careful conservation of the rainfall would probably lead to a better class of herbage than at present exists. Though the rainfall would probably not

be increased, it would certainly not be allowed to run to waste and to carry the virgin soil of the hill-tops down to the base level of the streams.

The writer when in Pretoria planted some trees in a trench cut across the drainage slope of a hill; when set, the soil round the roots of the plants reached a level 6 inches below the top of the trench. As the result of the September rains the trench was filled up to the top with diluvium in six weeks.

By carefully following the contours of the hills with trenches and banks, had the country been in the hands of the hill tribes of the frontiers of India, the soil would have been preserved and the water supply retained. Any deficiency of the latter would have been supplemented by irrigation by means of well-water. Belts of trees on the tops of the undulations of the ground, and terrace cultivation on the lower ground, would make Africa a rich country for the agriculturist, whose chief enemy then would be the periodic attacks of locusts.

Water Supply. — Now as regards water supplies other than surface streams, the rocks of series I. and II. are practically impervious, except the Transvaal dolomites. Series III., generally speaking, may be placed in the same category. Such old rocks, compressed and hardened by heat, crust movements, and pressure, only allow of the downward percolation of water through fissures and joints in their structure.

The rocks of series IV. are permeable, with the exception of the volcanic series. Thus we find a central region of horizontal rocks, of which this series is composed, where the rocks may be pierced with a probability of finding water, and a wide outer region where the rocks are practically impermeable, and further where they are distorted. Both regions are intersected in all directions by dykes of diabase which are impermeable.

We will consider first the central region, where the water which has fallen on this country of horizontal rocks finds its way rapidly in large proportion into the river beds, rushing precipitately down from the thinly-covered hill-tops into the streams, and thence into the sea.

A considerable part, however, sinks, after saturating the detrital surface material, into the soft sandstones and shales of the bed-rock, where they are uncovered by diabase. The

natural tendency for such percolated water will be to find its way out at such flanking edges of the horizontal rocks as may become exposed to the air, with a general tendency to escape along the line of drainage of the country which, as explained above, falls generally east and west of the line of the Drakensburg in the country north of Cape Colony.

Fig. 7 shows a section across a single hill and represents the condition obtaining throughout this central region, whether above the surface, as in the diagram, or below the surface: *a*, is the dolerite cap, which once extended in the directions a_1 and a_2; b, b_1, b_2, b_3, are the pipes and dykes of dolerite, leading in some cases right up to the level of the cap, in others failing to get so high. The dykes intersect the lines

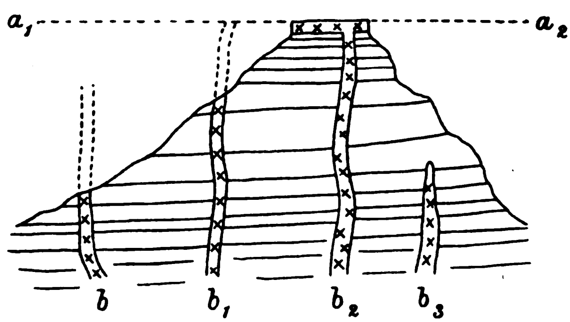


Fig. 7.

of flow of the water. They form a honeycomb of walls across the line of bedding of the sedimentary rocks and consequently prevent to a large extent the escape of underground water. A ground plan will further illustrate the position.

The sketch map (fig. 8) represents roughly the country west of Bloemfontein, the dotted lines indicating contours of 50 feet elevation, starting from the spot A, where the Bloemspruit crosses the line B. The watershed is roughly eastwards. The rocks of the country are Karroo Beds at this level. BB represents a dyke or wall of diabase cutting across the watershed. There are numerous dykes west of this running in various directions; this one is selected as being placed in the most advantageous position, besides being the most easily traced. The storm water flowing down the spruit has cut down the diabase, wearing it

level with its own bed at A, though on each side of the spruit it is considerably higher. Immediately west of the dyke is a large tract of recent alluvial deposit C, culminating in a spot situated in a *cul de sac* made by the dyke at D. D is marked by a large pond during most of the year. This pond is gradually filling up with mud to the level of the alluvium to the west. The water being unable to escape to the east, remains until evaporated. Not only does the dyke prevent the

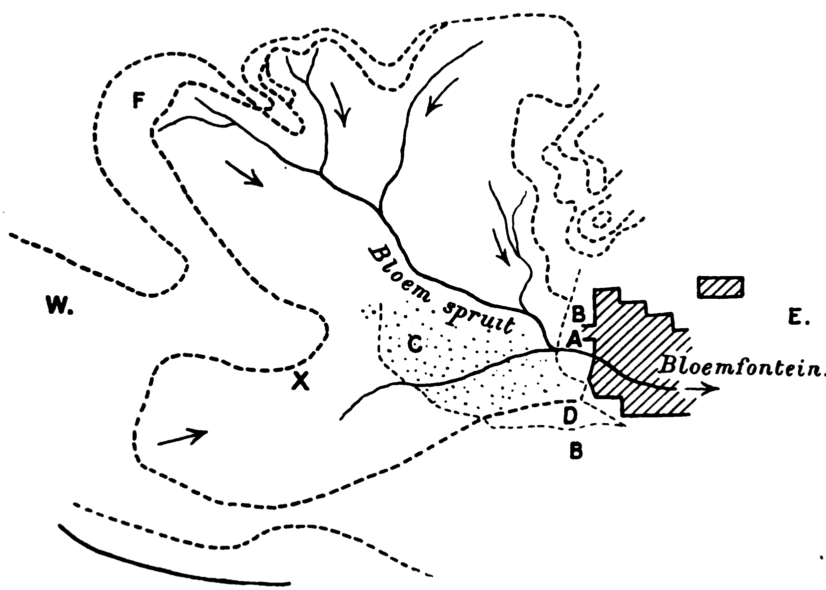


Fig. 8.—Country to west of Bloemfontein, showing dykes cutting across the surface drainage slope. BB, dyke of diabase; C, alluvial flat; D, shallow pond; →, direction of drainage; X, site of bore well.

escape of the surface water at D, but by its downward extension prevents the underground water to the west of it escaping, the result being that anywhere to the west water is reached rapidly by boring.

The lesson to be learnt is that in dealing with the horizontal rocks under consideration a dyke should be sought which cuts across the watershed; boring on the upland side of the dyke will furnish water. Experience shows that though it may be necessary to bore some depth—100 or more feet—once the

water is tapped it will rise in the bore to within a few feet of the surface. The water previously held in the rocks was not appreciable. On the removal of the rock by the boring apparatus the underground water rises to the level at which it was maintained previous to the boring, but is now appreciable as the water takes the place of the rock once filling the bore. In the case of these horizontal rocks the underground water will not, of course, rise to the height it may acquire when tapped through inclined strata.

There appears to be an idea among those who carry out water-boring in South Africa that if water is not reached within 70 feet it is not worth continuing the exploration. This may be a fact of value when the consideration of the cost of pumping the water to the surface has to be taken into account, especially for agricultural purposes. Generally speaking, if the site of the bore is carefully selected, it will not be necessary to sink as deep as 70 feet, unless there be some special reason for obtaining water through a bore situated on the top of a hill.

It is perhaps worthy of consideration how far the water from such wells is secure from pollution.

The country near Bloemfontein illustrated above was a vast camp in 1900. Excreta from man and beast fell on the soil, and their solutions must have percolated downwards with the flood water. How far did the rocks filter the water? If they did not filter the water, was the fæcal impregnation sufficient to appreciably affect the vast underground supply? For it must be remembered that this supply extends downwards until it rests on impervious rocks—probably Ecca beds—at some depth which has not been gauged below. The depth probably is some 900 feet, judging by the level of the Dwyka Conglomerate near Modder River station. It is difficult to believe that such a vast volume of water would contain a dangerous amount of microbial impurity. If pumped up through a bore from a level beneath that supposed to limit the downward extension of bacterial life, such water should be safe, provided ordinary precautions are taken to prevent contamination due to access of the more superficial water. But inasmuch as the supply may be drawn from wells into which drainage through the upper strata may occur, the probability of dangerous impregnation presents itself. It must be remem-

bered that wells dug on field service are not closed in, and must be regarded as simply reservoirs of water liable to contamination. The water must consequently be treated accordingly. Though we are here concerned chiefly with conditions bearing upon the presence of water, the presence of possibility of accession of contamination must not be allowed to escape notice. And as during active operations reliance has to be placed on supplies drawn from superficial sources the subject is a pressing one. It is not until the camp has become a permanent one that bore wells can be made to tap the deeper sources of supply.

A point deserving of serious consideration in water supplies from these horizontal strata is the diffusibility of acquired impurities in all directions.

In the sketch given above a watershed is shown having an easterly direction. If the country in the opposite direction is traversed for about a mile from the origin of the Bloemspruit, marked F in the plan, the hills to the west will be found to constitute a divide, from the western side of which the surface water flows westwards to the Modder River. Consequently it may be seen that the underground water has an escape in that direction also, as well as in the direction of the Eastern drainage slope, so far as the dykes will permit its escape. Remembering that we are dealing with *horizontal* strata we have here an obvious illustration of the fact *that whichever side of a drainage slope* is selected for the water supply, the dumping grounds will by soakage affect the water unless the refuse and excreta are either below the level of the water supply, or unless a dyke completely separates the two localities. A camp situated on a hill formed by tilted rocks may have the latrine physically above (see fig. 9) the well-water supply if on the reverse side of the hill, provided the latrines are below the layer of rock which holds up the water, as in the diagram.

It must be noted, however, that though physically above, the latrine here is geologically below the well. The impervious rock I is between the two.

But on a hill such as that shown in fig. 7, if approximate purity is to be obtained the latrine must be placed only on the reverse drainage slope. and below the level of the well,

unless the presence of a complete dyke can be demonstrated as separating the latrine from the water supply.

In the case of horizontal rocks the presence of a complete dyke between latrine and well would render the approximation of the two harmless; so also would the presence of an inter-bedded sheet of trap (see fig. 10), such as may be found in the hills of some parts of Natal where the older strata have become superficial. But the presence of the former must be convincingly proven before the experiment is tried. In the

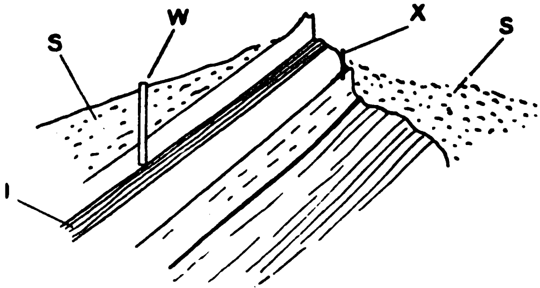
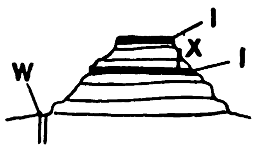


FIG. 9.—I, Impervious rock; W, well; X, latrine; S, soil and talus.



I. *Impervious trap rock.*
W. *Well.*
X. *Latrine.*

FIG. 10.

case of the latter formations it would be advisable to be positive regarding the completeness of the sheet of trap.

While recognising that propinquity of the camp to both water and latrines is eminently desirable, it cannot be too strongly impressed that every precaution must be adopted to maintain the water supply free from risk of contamination, even though the force may be provided with means of water sterilisation. Every camp should be located with due regard to water supply. It is a strategic consideration. No garrison, no field

force, can afford to be away from water. The site of the camp must, then, be below the level from which drinking water is drawn. Latrines and refuse heaps can then be placed on the side distant from the water.

The point is such an important one that at the risk of further digression it must be insisted that strategic positions are those near a plentiful supply of drinking water. What used to be called commanding positions are valueless (apart from the fact that those occupying them present admirable targets to an enemy) unless they happen to have a sufficiency of needful water.

If water is to be obtained from wells on an alluvial flat, especially in country with horizontal rocks, the position of the latrines becomes one of moment, even though the water be tapped from the bed-rock below. Take the country to the west of Bloemfontein (fig. 8). Suppose the spot marked X to represent the site of a well of considerable depth. In order to guarantee that no impurity shall get into the water it would be necessary to place the dumping grounds and latrines on the eastern side of the dyke—a mile away! When the locality has to provide for many thousands of men, such considerations are impracticable even though perfection is to be sought for.

So many are the factors connected with the preservation of water supplies from impurities, factors which cannot be ascertained in an unexplored country at short notice, that it is impossible to guarantee without delay that the location of a latrine in any selected spot will certainly not affect the water supply close by. A column arriving in an enemy's country, the geology of which has not been even approximately worked out, has to select a water supply and locate its refuse spots at once, guided chiefly by the general lie of the country, and in a few cases where special knowledge is available, by a general guess at the disposition of the rocks. The result may be accidentally a success. If the camp is a one-day halt, the mischief done may be *nil*. But the principle is unsound, relying as it does on sketchy data. For camps likely to be permanent the services of a geologist may in time produce satisfactory data which will form guides for the selection of locations for wells and latrines; but this will only be accomplished some time after the army has been encamped on a position.

The general outcome of experience teaches that there are a few broad indications which must be obeyed. Such indications are set forth in Regulations (combined training). These are empirical, and insufficient guarantees of complete hygiene. Fortunately there are other steps which can and must be undertaken to obviate the ill-effects of contaminated water and the dissemination of disease-laden excreta. These are boiling of the former always; of the latter, so long as fuel can be spared for the purpose. Further, the sinking of deep bore wells for the supply of permanent camps becomes an essential.

The main principle to be kept in view should be first to obtain a good and plentiful supply of drinking water. Then, as mentioned above, the camp should be placed geologically below the supply; the latrines again still lower down.

Bearing these facts in mind, henceforward these remarks will be confined to a few further illustrations of water supply more or less distinct from the question of its protection from contamination.

(*To be continued.*)

DOMESTIC FLUSHING.

By Major W. H. HORROCKS.
Royal Army Medical Corps.

The object of the water-carriage system of refuse disposal is to remove dejecta as rapidly as possible from the neighbourhood of the house. To be completely successful in the ordinary dwelling, the quantity of water used for flushing, the design of the water-closet, the size and fall of the house drain and the type of the intercepting trap, must be so arranged that all excrementitious matter is at once removed from the pan of the closet to the sewer; none of it must be retained in any part of the house system or in the intercepting trap. In 1898 Porter made some interesting experiments for the County Borough of Stockport in order to discover the best combinations which would effect the desired result. He arrived at the following conclusions :—

(1) That three gallons is the minimum amount that can be relied upon for efficient flushing, *i.e.*, prompt carriage of dejecta through closet, drain and interceptor to sewer, even with a good form of wash-down closet, well laid 4 in. or 6 in. drain, and good 4 in. interceptor.

(2) That if an inferior type of closet be used, or if the intercepting trap exceed 4 in. in diameter, three gallons is not sufficient for effective flushing.

Consequently in order to obtain effective domestic flushing it would appear necessary to have a wash-down closet, a three gallon flush, a 4 in. drain and a good type of intercepting trap, with a diameter not exceeding 4 in. When examining the drainage of Gibraltar I found it had been the custom for years past to use a 6 in. drain and 6 in. Buchan trap for the house system. Judging by my previous experience and the results of Porter's experiments it did not appear likely that such a combination would lead to effective flushing, and an examination of the Buchan intercepting traps showed in nearly every case an accumulation of fæcal matter in the house side of the traps. It was of course impossible to take up all the house drains of 6 in. diameter and put down 4 in. pipes, and even then accord-

ing to Porter a three gallon flush would not carry dejecta through a 6 in. trap. It appeared necessary, therefore, to remove all the 6 in. Buchan traps and introduce others 4 in. in diameter in order to obtain efficient domestic flushing. The question then arose, would a three gallon flush carried through 6 in. pipes effectively clear a 4 in. Buchan trap, and if not, were there any traps recently designed capable of being effectively flushed under the conditions mentioned? In order to clear up the matter I designed a series of experiments and made use of the following apparatus.

(*a*) A wash-down closet.

(*b*) A water waste-preventing cistern, graduated to deliver three gallons and two gallons, connected to the closet by five feet of piping.

(*c*) Forty feet of glazed stoneware 6 in. and 4 in. drain pipes, with clay joints and set with a fall of 1-40.

(*d*) Disconnecting traps of various types.

The first series of Experiments were made with a three gallon flush. The wash-down closet was connected to the 6 in. pipes, and various patterns of 6 in. intercepting traps were attached in turn to the end of the forty feet of drain pipes. Fæcal matter and paper taken from a trough closet were placed in the pan of the closet charged with water in the usual manner, about six ounces of solid material being used in each experiment. The intercepting traps were also filled with water. The following results were obtained :—

Flush	Diameter of Drain	Type and Size of Intercepting Trap	Result
3 gallons	6 in.	"Buchan," 6 in. ..	All the fæcal matter was retained in the trap.
,,	,,	"Oates and Green," 6 in.	,, ,, ,,
,,	,,	"Salus" (Cliff and Sons), 6 in.	,, ,, ,,
,,	,,	"Beaucliff," 6 in. ..	,, ,, ,,
,,	,,	"Doulton," 6 in. ..	The trap was cleared completely.

The closet pan was cleared in every case. These experiments showed that Porter's second statement is not absolutely correct. A three gallon flush passing through 6 in. pipes will effectively flush the house drainage if a Doulton trap be employed.

The second series of Experiments were made under the same conditions as regards flush, wash-down closet and intercepting traps. The closet and traps were, however, now connected by the 4 in. drain pipes. It was at once noticed that the three gallon flush had a much greater clearing effect when carried by the 4 in. drain pipes. The following results were obtained :—

Flush	Diameter of Drain	Type and Size of Intercepting Trap	Result
3 gallons	4 in.	"Buchan," 6 in. ..	All the fæcal matter retained in the trap.
,,	,,	"Oates and Green," 6 in.	Trap cleared completely.
,,	,,	"Salus," 6 in. ..	,, ,, ,,
,,	,,	"Beaucliff," 6 in. ..	A little fæces retained.
,,	,,	"Doulton," 6 in. ..	Trap cleared completely.

This series of experiments demonstrated the marked superiority of the modern traps manufactured by Oates and Green, Cliff and Sons, and Doulton. The cascade action in the Buchan trap did not have the clearing effect which was anticipated, it appeared that what was gained by the fall was lost by the friction against the sides. The Beaucliff trap suffered from the same defect, but not quite to the same extent.

Third series of Experiments.—In this series a two gallon flush was employed, the closet and intercepting trap being connected by 6 in. piping. The results were as follows :—

Flush	Diameter of Drain	Type and Size of Trap	Result
2 gallons	6 in.	"Buchan," 6 in. ..	Fæces all retained in the trap.
,,	,,	"Oates and Green," 6 in.	,, ,, ,,
,,	,,	"Salus," 6 in. ..	,, ,, ,,
,,	,,	"Beaucliff," 6 in. ..	,, ,, ,,
,,	,,	"Doulton," 6 in. ..	A little fæces retained.

The two gallon flush was quite insufficient to clear a 6 in. trap, even when the best form of interceptor was employed.

Fourth series of Experiments.—In these experiments 4 in. pipes were used to connect the trap and the closet, the flush being two gallons. The results were as follows :—

Flush	Diameter of Drain	Type and Size of Trap	Result
2 gallons	4 in.	"Buchan," 6 in. ..	Fæces all retained.
,,	,,	"Oates and Green," 6 in.	,, ,,
,,	,,	"Salus," 6 in. ..	,, ,,
,,	,,	"Doulton," 6 in. ..	A little fæces retained.

The two gallon flush again failed to clear the intercepting traps.

Fifth series of Experiments.—In this series trials were made with 4 in. traps of the Buchan and Doulton types, the flush being two gallons. The results were as follows :—

Flush	Diameter of Drain	Type and Size of Trap	Result
2 gallons	4 in.	"Doulton," 4 in. ..	Trap not cleared ; a little paper retained.
,,	,,	"Buchan," 4 in. ..	Fæces retained in the trap.
,,	6 in.	"Doulton," 4 in. ..	,, ,, ,,
,,	,,	"Buchan," 4 in. ..	,, ,, ,,

Sixth series of Experiments.—In this series the flush was increased to three gallons. The results were as follows :—

Flush	Diameter of Drain	Type and Size of Trap	Result
3 gallons	6 in.	"Doulton," 4 in. ..	Trap cleared.
,,	,,	"Buchan," 4 in. ..	Fæces retained in the trap.
,,	4 in.	"Doulton," 4 in. ..	Trap cleared.
,,	,,	"Buchan," 4 in. ..	,, ,,

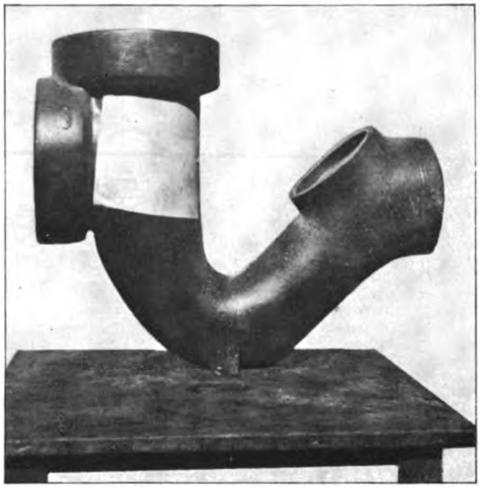
A three gallon flush carried through a 4 in. pipe appeared very effective and completely cleared a 4 in. "Buchan" trap.

Conclusions.

(1) The ideal combination, to obtain effective domestic flushing, appears to be : (*a*) Wash-down closet ; (*b*) three gallon flush ; (*c*) 4 in. drain pipes ; (*d*) 4 in. intercepting trap, preferably of the "Doulton" type.

(2) A two gallon flush is not sufficient to carry dejecta through a wash-down closet drain, and intercepting trap to the

"Doulton."



"Salus" (Cliff & Sons).

"Oates & Green."

"Buchan."

sewer even when the best conditions are employed, viz., 4 in. drain pipes and 4 in. "Doulton" intercepting trap.

(3) A three gallon flush is sufficient to effectively clear the house system when a "Doulton" type of trap 6 in. in diameter is connected to a wash-down closet by 6 in. drain pipes.

(4) The "Salus" and "Oates and Green" 6 in. traps are effectively cleared by a three gallon flush when the closet and trap are connected by 4 in. pipes.

(5) The "Buchan" type of trap does not lend itself to effectual clearing of the house system. Fæcal matter will always be retained in the trap when 6 in. and 4 in. drain pipes are used to connect a wash-down closet with a 6 in. trap. If, however, a 4 in. trap is connected to a wash-down closet by 4 in. drain pipes, a three gallon flush will give fairly good results.

The photographs illustrating the types of intercepting traps were taken by Lieut. Mc K. Skinner, R.A.M.C.

FEVERS IN SIERRA LEONE (MOUNT AUREOL), BEING A PRELIMINARY ACCOUNT OF AN ENQUIRY INTO THE CAUSES OF THE CONTINUED PREVALENCE OF ILL-HEALTH IN AN APPARENTLY FAVOURABLY SITUATED HILL STATION.

By Major F. Smith, D.S.O., and Major A. Pearse.
Royal Army Medical Corps.

Mount Aureol is some 800 feet above sea-level. It is occupied solely by troops (European Artillery and negroes of the West India Regiment). It is cut off by height and about half a mile of uncultivated ground from the nearest portion of the native town (Freetown) lying on the 100 feet level below.

Here then is a place most favourably situated for freedom from malaria and for the practice of malarial prophylaxis. The air is exhilarating, the water supply good, there are no pools of water in the barrack grounds, the population is under disciplinary control, no natives live in the station, the military occupants are almost entirely adult men (one woman and one child live in the barracks). Nevertheless Mount Aureol is not healthy.

The admission rate for fevers at Mount Aureol during the present year has averaged roughly 1,955 per 1,000 per annum for Europeans, and 1,329 per 1,000 for West Indians.

It seemed that a profitable field of enquiry lay before us at Mount Aureol, for this sanatorium is more or less a reproach to us. With a wave of the hand, so to speak, crowded West African towns have been (we are told) rendered salubrious. Meantime health in these barracks is unchanged. On all sides we hear men in high positions scoffing at what they call the "mosquito theory"; for is it not a fact, they say, that there are no mosquitoes at Mount Aureol. Feeling then that the good repute of preventive medicine was in jeopardy, we decided to endeavour to restore confidence in the practical utility of scientific methods by devoting our energies to the elucidation of this fever problem.

Our line of investigation is this:—

Question 1.—What is the real nature of Mount Aureol fevers?

(This part of our enquiry is doubly necessary in view of a suspicion that coast fevers are carelessly diagnosed by physicians, that every rise of temperature is ascribed to remittent fever, and that records of malaria prevalence are therefore unreliable.)

Question 2.—Where and from whom are the fevers contracted ? (That is to say, do men pick up their illnesses when visiting the town, or are they infected in barracks ?)

Question 3.—What measures can we advocate for the betterment of health in barracks ?

With regard to *Question* 1, a systematic examination of blood in a good number of cases was necessary. It was arranged that admissions to hospital should be diagnosed clinically before the diagnosis by microscopes was divulged (the only difference, if any, from the usual practice would be in the direction of increased care born of the knowledge that the diagnoses were to be checked by microscopic methods).

All the slides were examined by the aid of Leishman's excellent stain.

Forty cases were dealt with under the above conditions. Of these twenty-nine showed malarial parasites on the first and one on the sixth examination.

The organisms were classified as below :—

Tertian	1 case.
Quartan	1 case.
Malignant	28 cases.

One of those in which the parasite was not found was "blackwater," which is always returned as malarial ; the negatives therefore may be taken as nine in number. Six of these were only examined once, in some cases after quinine and during defervescence ; in view of the fact that in one case above noted parasites were not found until the sixth inspection, we think it likely that a portion of these six were really malarial. One man developed a rash and his disease was changed accordingly on clinical grounds. Two men showed no parasites in three examinations (one of them recovered under quinine, and he returned to duty ; the other is a chronic case still under notice, and likely to prove tubercular).

Allowing due weight to the negative results, we must still admit that *the bulk of fevers at Mount Aureol are in fact malarial*.

There is not much ground for the opinion that diagnoses are more incorrect here than elsewhere. The medical officer is bound to select out of the College of Physicians' nomenclature a name for every disease in hospital, and when in doubt he naturally falls back upon the common disease of the country just as in England the puzzled practitioner uses the term *influenza*. This seems to be the least harmful course from the etiological point of view in records. Anyway it is clear that if we can do away with the malaria, Mount Aureol will be a healthy station.

As to *Question* 2, where do the fevers come from? We have a much more difficult point to settle. The hospital is situated on a well-aired spur some 200 feet distant from, and 200 feet below, the barracks, and the patients are quinined—infection from the hospital must be unusual. The points bearing on the matter seem to be:—

(1) Are there any infectious cases in barracks?

(2) Are there in barracks the insect agents necessary to the spread of the disease?

The question of initial cases presents no difficulty, for the troops came from the West Indies originally. Moreover, it is beyond dispute that some cases are contracted in the town, for the men at Tower Hill suffer very much from malarial fever, and Tower Hill barracks lie in the middle of the town. (Indeed, the continued prevalence of fever at Tower Hill is somewhat of a disparaging commentary on the results claimed to have been effected by mosquito brigades in Freetown, and as far as common report can be credited the same may be said of the natives' statements that this has been a bad fever year for Freetown.)

Infected Men at their Duty in Barracks.

At the ordinary weekly inspection by the medical officer a few sickly looking men from two companies were selected for blood examination. Out of twenty-two West Indian men so picked out eight were found on the first examination to be harbouring parasites. We may assume that these eight represent a larger number of infected men sleeping in the barrack rooms.

The solitary child was also found to have parasites. (She had been living in Freetown until a few weeks ago.)

The European company of Artillery had unfortunately gone home just before our work was begun; but we have enough evidence that there is abundant infective material in the barracks provided the essential insect hosts are at hand.

The objection now comes in. Mosquitoes are singularly scarce! Some officers and all the men sleep without nets. They say that there are no mosquitoes. That their statements are only relatively true we have proved by capturing a few culex in quarters of officers and men (not one of them, however, appeared to have fed on other than vegetable matter). Prolonged searching has brought no anopheles to light in barracks. As set forth in Appendix VIII., A. M. D. Report for 1900, however, by one of us (F. S.), there is a mountain brook in the jungle not far from the barracks, and the holes in the rocky bed of this stream contain many larvæ during the dry season (the season which is now upon us). At a later period in the dry season than that with which we are now dealing a few adult insects were in those days found in Mount Aureol barracks. (That was in the early part of the year when the stream-bed contained least water and most anopheles larvæ, and when as a matter of fact the fever rate was high.) Still, we are accustomed to find that where fever is very prevalent the anopheles are not difficult to discover, and the fact of our inability to demonstrate their presence in barracks suggests that the fever may be contracted outside. It may be that we might have found them before the period dealt with, or that we shall find them later on; for after all a large airy barrack-room affords many hiding places for such small objects.

The position then in recapitulation is this:—

(*a*) There is a large amount of malarial fever at Mount Aureol.

(*b*) Some of it, certainly, is contracted in Freetown.

(*c*) Part of it may be contracted in Mount Aureol.

(*d*) Anopheles are bred in a stream not far away and might be expected to come to barracks as being the nearest inhabited place.

(*e*) During the period from the latter part of November to the end of December, we have been unable to find anopheles in barracks, though we have found them on the banks of the stream.

It remains to us to make further enquiry into the anopheles question at Mount Aureol, for until we find an infected mosquito in barracks we cannot say for certain that any of the illness is contracted there. It is our purpose to construct traps and also to fumigate barrack rooms in the hope of recovering the killed insects. We defer the consideration of prophylaxes until we are on safer ground as to this mosquito question, merely premising that we consider it impracticable to do away entirely with the breeding of anopheles in the brook, having regard to the fact that the stream forms our drinking water supply, and to the enormous expense which would be entailed by converting the two miles or so of brook into an aqueduct.

Major L. S. Blackden, 2nd West India Regiment, Commanding the Detachment at Mount Aureol, has entered into the spirit of our quest and kindly facilitates matters. He has, moreover, used his mosquito net as a trap, and himself as a bait, but with no luck, or rather ill-luck.

In conclusion we wish to say that No. 17872 Pte. C. R. Thorp, R.A.M.C., has rendered us valuable assistance in our work.

A CURIOUS EPIDEMIC RESEMBLING SMALL-POX.

By J. WELLAND.

Late Lieut. Royal Army Medical Corps; 6th King's African Rifles.

THIS epidemic occurred among the black troops at Bohotleh in Somaliland while I was in medical charge of that post.

While I call it an epidemic resembling small-pox, I must admit that I was at first very doubtful as to its true nature, and I did not know whether to call it small-pox or chicken-pox; however, all things considered, I think it resembled small-pox more than any other disease.

Although, perhaps, no disease has so many varieties as small-pox, I have never seen a variety or description of one which quite resembles the one which forms the subject of this essay.

The origin of the epidemic is very obscure, for although the disease followed very shortly on the arrival of a draft of levies from Burao, no cases of the kind had been seen or heard of at that post; but the infection may have been conveyed from Berbera, a town with a large population where almost any disease might occur unrecognised.

While the disease was in progress at Bohotleh some troops came in from another quarter, and some of these left after a week, returning after a similar period; one of these men then contracted the disease, thus enabling me to ascertain the *incubation period* of the disease, which must, therefore, be somewhere between seven and fourteen days.

None of the men who caught the disease were marked by small-pox, or vaccination; whether or not they had chicken-pox it is impossible to state. Those infected were eleven men and one boy; the disease did not resemble modified small-pox, or chicken-pox, any more than common small-pox, as will be shown.

All the cases were seen on the third day of the disease; they all complained of having suffered from headache and malaise, and of having felt ill for two days previously; there was no history of any rigor; temperature on the morning of admission was normal; no initial rashes of any kind could be detected. Simple erythema of a black skin is, of course, very

difficult to detect, but there was nothing to indicate the presence of a primary rash, nor was there any indication of primary fever. The specific eruption began on the morning of the third day of the disease (first day of inspection); small papules were to be seen on the forehead, face and chest, also on the abdomen and back; these papules were rather sparsely scattered over the surface of the body in the localities indicated; by evening some of the papules were capped with vesicles; on the fourth day all had become vesicular; on the fifth day the fluid in the vesicles was opalescent, and umbilication had commenced; this umbilication of the vesicles, which occurred in most of the cases, was curiously unlike that of common small-pox, which is determined by a hair, a duct or a fibre; the umbilication in this case began by the formation of a minute scab in the centre of the vesicle; and once formed the umbilication was permanent; no umbilicated pustule burst its depressing band, and became hemispherical, as often happens in common small-pox. On the sixth day all the spots had become pustular, and some of those not already umbilicated were undergoing that process; others remained hemispherical till they dried; I do not think any of the pustules burst, but on the following day all were drying, and becoming covered with scabs; these scabs were not brown, but perfectly black.

By the seventeenth day all the scabs had fallen off leaving pink depressions, instead of the usual red elevations; these soon disappeared, leaving no permanent mark.

There was no general swelling of the skin either of the face, scalp or fingers, there was no shedding of the hair or nails, and no pustules were observed on the mucous membranes; one case, indeed, suffered from severe diarrhœa in the scabbing stage, but this may or may not have had any connection with the distribution of the rash. The pyrexia was not the least curious part of this disease.

It appears that the fever of the variety is highest when that of common small-pox is lowest; and when the fever of small-pox is highest there is no fever at all in the variety.

In the cases observed there was no sign of any initial pyrexia, or intermediate drop, nor was there anything corresponding to the suppurative fever of small-pox; temperature on the morning of the third day was about normal, at all events

not above 99° F.; in the evening of that day it was 102·5°; the following morning temperature was normal, 98·4°; evening of the fourth day 103°; next morning normal; evening fifth day 103°; sixth day, morning normal, evening somewhat lower than previous evening; seventh day onwards the temperature did not rise above the normal limit.

Headache and malaise continued from the first day to the sixth day of the disease, after that the patients felt quite well.

All the cases conformed very closely to the above type of pyrexia, except one, who had no pyrexia at all at any time, but there were several wide differences in the rash in different cases, *e.g.*, in one case the pustules were very large—nearly half an inch in diameter—and one of these formed a small cutaneous abscess. In the case of the boy above mentioned, the spots were very small and closely set all over the surface of the body, and must have numbered some thousands, but there was no general swelling of the skin; the rash in most cases did not appear on the backs of the hands; in one case the vesicles did not umbilicate.

The pulse throughout the cases was but little affected at any time and the respiration not at all.

Sufficient contrast with common small-pox has already been shown; it remains to contrast the disease with modified small-pox, and with chicken-pox; as regards the former it is enough to say that there was no initial fever or rash, and that the specific eruption completed all stages; as regards the latter, the eruption in most cases completed all the stages peculiar to small-pox undergoing umbilication and becoming pustular, while the temperature rose to 103°, rather high for chicken-pox; there was no sign of enlarged glands; also chicken-pox occurs in Somalis as a very different and much milder disease than the one above described. I have seen many cases of it in adult Somalis, and other Africans.

No cases were lost, nor were there any complications or sequelæ, except the case of severe diarrhœa above mentioned.

As regards the treatment of the cases no drugs were given except in the case of diarrhœa; the patients were fed on boiled rice and camel milk, and got on very well.

In order to control the epidemic, all cases were immediately and thoroughly isolated; and had their clothes boiled, and

themselves washed, before being allowed to return to camp; they were attended only by men who bore the marks of previous small-pox. Moreover, every one in camp was carefully inspected daily while the epidemic lasted; partly owing to these measures and partly to the comparative mildness of the disease the cases were limited to the number of twelve.

STERILISER FOR INFECTED DISCHARGES.

By Major H. A. CUMMINS.
Royal Army Medical Corps.

In South Africa, during the epidemic of enteric fever in our Army, having been placed in charge of hospitals in which numerous cases of this disease were treated, I felt the urgent necessity for the satisfactory disposal of infected matters. Under these conditions I was led to experiment in boiling all excreta and slops at once on removal from the wards.

I feared at first that a great nuisance would have been caused by so doing, but found that this was not the case, and that instead the matter after being heated for a few minutes lost the fæcal odour; the only smell noticeable was that of ammonia from the urine. During the process of boiling a small quantity of Izal or carbolic acid covered any smell.

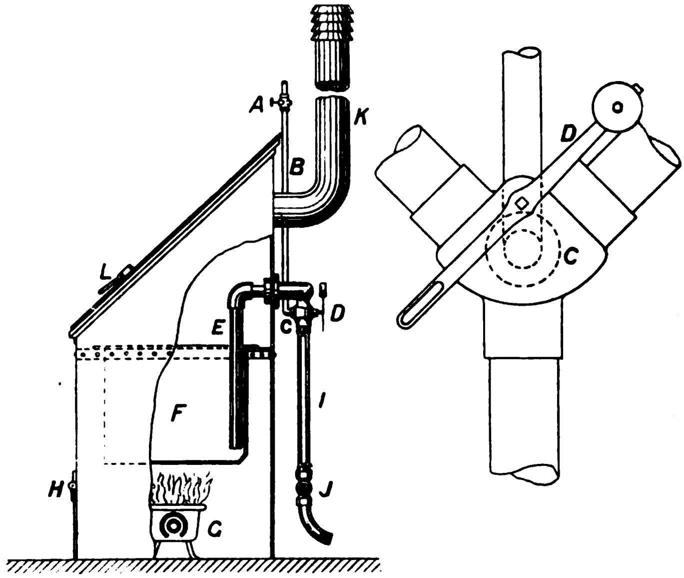
I gave the result of these observations in two papers published in the *British Medical Journal* in 1900 and 1901. Since my return from South Africa in 1901, I have been working on the subject, as I believed there were considerable possibilities in this connection, and have succeeded in designing an apparatus, made for me by Messrs. J. Defries and Sons, London, which can be placed in the annexe of any hospital ward.

It consists of a vessel (F) divided into two compartments, each provided with a siphon (EI), and enclosed in a hearth with a gas or coal fire, and a hood sloped to L, from which proceeds the flue, K. The siphons are connected to a common flow pipe (I) through a valve (CD). The upper and lower parts of the apparatus communicate by perforations in a flange connecting the vessel F with the body of the hearth, through which the products of combustion from the fire rise in a quick stream and so determine a draught which carries all vapours from F up the chimney. The utensils containing the excreta are emptied into one compartment of F, and are themselves placed in the other. An emulsion of crude carbolic acid or Izal (about ½ oz. to the gallon) may be used, which serves for the treatment of a number of charges, but of course is not a necessity. The con-

tents of F are boiled, thus attaining a temperature at which the infection of typhoid fever is destroyed with certainty.

When it is desired to empty the vessel, the valve (CD) is thrown over to close one or other of the pipes B; water is allowed to flow down the pipe B through the valve A and out through valve J, and a siphon (EI) is thus started which empties the compartment of which the valve is left open.

Steam may be used for boiling where convenient, and the apparatus can be adapted for the treatment of the entire bath-water of an infectious hospital, or for use with latrines abroad.



For field purposes the vessels may be made detachable and nesting, the fire being lit in a trench in the usual way, thus providing a very portable appliance.

In practice the apparatus may be considered a "sterilising water-closet," as there is always a supply of boiling water ready for disinfecting purposes. Doubtless one feels at first prejudiced against the idea of boiling. At Netley, however, I observed the working of two of my sterilisers, one heated by gas in the annexe of the enteric fever ward. and the other in the open air, used for the dejecta of men suffering from *bil-*

harzia, and heated by a coal and wood fire, but nothing offensive could be detected either by myself or by the attendants.

The former appliance acted as a powerful air extractor, owing to the exit flue-pipe discharging at the level of the foul air outlets of the sewers. When in ordinary w.c.'s a stool is emptied the odour pervades the annexe for a considerable time, and is most objectionable; but this does not occur in the above apparatus, as all the foul air is at once removed by the strong up-draught of the flue, and is dissipated high in the atmosphere.

Regarding the open-air steriliser, the dejecta of about twenty men, for whom the bucket system was in use, were treated daily for *bilharzia*. The fæcal matter during the process of being emptied from the buckets into the steriliser had, as may be supposed, a most unpleasant smell; but during sterilisation there was no odour, as the vapours passed up the flue, and mixed with the smoke, &c., and were discharged high in the air. The sterilised matters when run off were practically odourless.

This boiling system gives one a fair idea of what might be done in a country like India, where latrines are liable to infection from ambulatory cases of typhoid, cholera and such like. An apparatus of small dimensions is capable of dealing with the contents of a latrine used by one or two hundred men, at the cost of about 28 or 30 lbs. of coal or wood daily.

Anyone who has met the ordure carts abroad knows what an odour comes from them. With this sterilising process no smell would be discovered, as the contents of the carts on the way to the place selected for disposal would previously have been rendered odourless, and in addition harmless. This method could easily be carried out in cholera camps, or in ordinary standing camps, as well as in cantonments.

I have found in practice that sentimental objections soon disappear when the apparatus is seen working, and the advantages to the nurses become apparent. The fæcal matter need only remain in the chamber about ten minutes, when it can be run off and fresh water let in as in an ordinary w.c. A great advantage is that the dejecta, &c., of a large number of cases can be treated in a comparatively small apparatus. The bed-pans become clean after a few moments' scalding, and all crevices, got at with so much difficulty under ordinary cir-

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cumstances, are thoroughly purified; and there is no risk to the patient of burning by carbolic acid or other disinfectant in the event of neglect on the part of the attendant to wash thoroughly, as sometimes occurs when such chemical disinfectants are used.

A smaller apparatus, on the same principle, can be made for hospitals, for the sterilisation of sputum and spitting cups of tubercular cases.

The apparatus also provides for the sterilisation of slops, including infected bath-water, if necessary. This, in my opinion, is very essential, as the water used in washing patients suffering from scarlatina, enteric, small-pox, &c., is obviously infectious. The discharges in any other infectious diseases, such as cholera, plague, diphtheria, &c., can be dealt with on this principle.

I have been led, in the case of alvine and other discharges, to prefer hot wet sterilisation to either destruction by heat or to cold chemical disinfection, not merely by the experience which I have had of the apparatus described above, but by a consideration of what appear to me to be the conditions under which the several processes inevitably work. Not only by reason of the extreme infectivity which is liable to occur in liquid discharges, but also by reason of the usual consistency of the discharges in typhoid cases, it is practically indispensable to any scheme of heat destruction that, before the infected mass is burnt, it should be mixed with a sufficient quantity of sawdust or other combustible, to absorb most or all of the moisture. It is then necessary to empty this mass out into the destructor, and then one has left an infected surface which is not only larger than it was before treatment, but much drier and more capable of giving off its infection. It is not until this utensil has itself been thoroughly disinfected that any advance has been made towards reducing the danger from the infected stools; which, on the contrary, has been distinctly increased after each of the manipulations to which I have referred; and for the ultimate disinfection of the utensils in the absence of a heat method, recourse has to be had to chemical disinfection; in regard to which nothing is more clearly ascertained than that it is untrustworthy unless an intimate mixture is carefully made between the disinfectant and the mass to be disinfected, an operation which is repulsive and

dangerous in itself and extremely liable to be neglected. I also think that importance must be attached to the fact that the nearer the steriliser, whatever it may be, is to the patient the less is the danger of infection through splashing, and this distance can necessarily be cut down much more with a hot wet steriliser than with a destructor.

Seeing that oysters and other edible shell-fish can become infected in the tidal waters where they live, it seems very improbable that pathogenic organisms disappear or are crowded out by other microbes in sewers. Consequently it would be advantageous to have a thorough sterilisation of all matters passing into the drains, not only enteric excreta, but slops from patients suffering from any infectious distemper. This view is supported by the consideration that in matters of disinfection *bis dat qui cito dat;* and if it can practicably be done, it is far better for the discharges of the weaklier who find their way into hospital to be disinfected as a matter of routine, than for a certain proportion of them to communicate infection to the drains, as well as to the privies, and to the staff, during a period of uncertain or missed diagnosis.

I am greatly indebted to the authorities at the War Office and those at the Royal Victoria Hospital, Netley, for having given me facilities for carrying out my experiments in this subject.

MILITARY PLAGUE HOSPITAL, MAITLAND, CAPE TOWN.

By Col. D. BRUCE, F.R.S.
Royal Army Medical Corps.

The object of these few notes is to place on record in a small way the plan of this hospital, so as to assist others in preparing plans in like cases.

First, a few words in regard to the position and surroundings.

This hospital is built on the Cape Flats, four miles to the east of Cape Town and about three miles north-east of Table Mountain.

The main line of the Cape Government Railway lies one mile to the north, and the two main line railway stations, Montague Bridge and Maitland, are each distant one mile. A quarter of a mile to the north-eastward is the Uitvlugt Civil Plague Hospital, and near that is the Native location.

The country round about is very flat, as the name Cape Flats implies, but from the hospital ground there is a fall of a few feet into the so-called Black River, a sluggish stream which lies about 300 yards to the south-west. The geological formation is very regular hereabouts and consists of a coating of sand, varying from a few inches to a foot or two in depth, lying on an impermeable layer of ironstone. This ironstone is roughly from 3 to 6 feet in thickness and overlies a bed of clay.

The site itself on which the plague hospital is built is very flat and, indeed, somewhat hollowed out or saucer-like, so that at first in the rainy season the water collected in pools and the soil was waterlogged. This state of things has been improved by digging a trench, some 3 feet deep and some 200 yards long, from the centre of the hollow through the rim of the saucer to reach a natural sluit draining into the Black River. Since this was done the surface water has disappeared quickly from the hospital grounds.

The water supply of the hospital is conveyed in pipes from Rondebosch and is of good quality. In order to ensure having a supply in hand, four large tanks, holding 1,600 gallons, have been placed on a wooden stand 10 feet above the ground. From these tanks the water is led in iron pipes to the various buildings.

The disposal of used water from the kitchens, wash-houses, &c., was a matter which required some consideration. It was evident that if this was allowed to run into shallow surface drains it would in time create a nuisance. If it had been possible to cement the drains, this way might have been used, but the cost of cementing was not to be thought of, especially as the hospital might only be in use a short time. The only way left then was to run each waste pipe into a tank sunk in the ground. From these tanks the used water is pumped into water carts and carried to a suitable place. This means some native labour, but was the only way out of the difficulty.

The method of disposal of the excreta of plague patients is to take them at once to the destructor shed, mix them with sawdust and burn. A plan of the destructor drawn to scale is given below. The staff use the pail and dry earth system in ordinary use in this colony.

General Ground Plan of Hospital.

The general ground plan speaks for itself and needs no explanation. As the huts are the common corrugated iron huts so much used in this country for barracks, &c., a detailed description of them would be time misspent. They were taken from the old Yeomanry camp which used to stand near here, and are not always the most suitable for the purpose they are put to in this hospital.

There is always some difficulty in laying out and arranging the position of the wards, &c., of a hospital, hence this plan may be found of some use. The four wards are placed end to end, and run north-west and south-east. This is on account of the gales of wind which seem to be always blowing over the Cape Flats from one or other of these quarters.

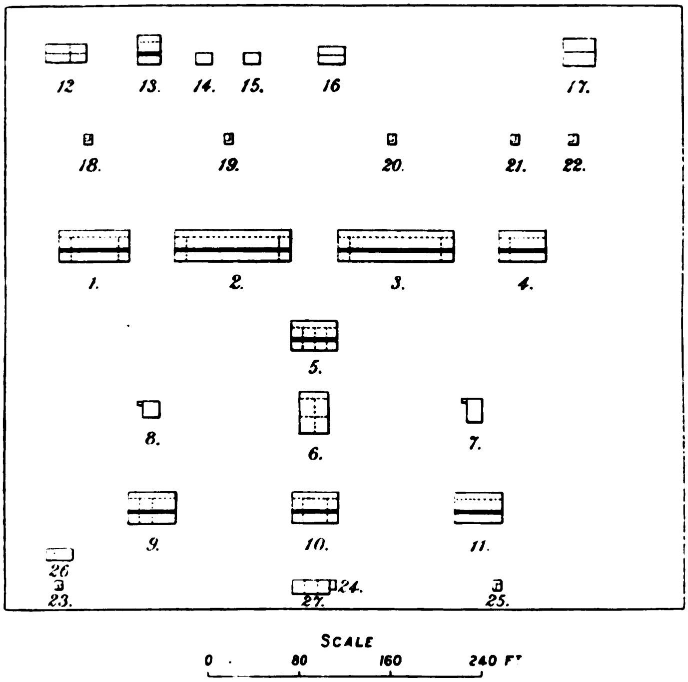
All the huts are raised a foot or eighteen inches above the ground, and this distance might be increased with advantage. They are also supposed to be made rat proof by a screen of wire netting filling up the spaces between the ground and the lower edge of the walls, but this is more apparent than real as there is space left by the corrugations large enough to admit any moderate-sized rat.

The Destructor.

The plan of the destructor given on page 295 is drawn to scale. I think it is too large for a small hospital

such as this, but would be suitable for a stationary or general hospital of from 200 to 1,000 beds.

The idea was taken from one at No. 2 General Hospital, Pretoria, where Col. Keogh, R.A.M.C., said it was found to be very useful. For my part, I think a destructor such as this should be in every military hospital, where fuel is to be had,



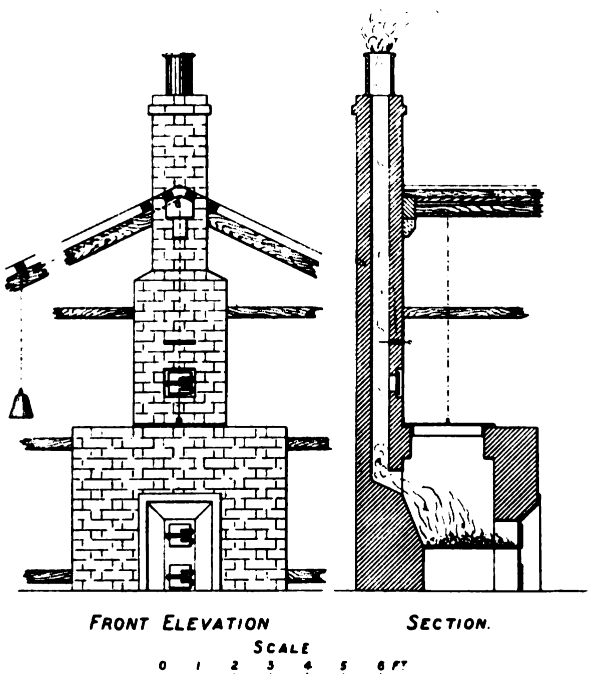
PLAN OF HOSPITAL BUILDINGS.

1, 2, 3, 4. Wards.
5. Offices and Stores.
6. Laboratory.
7. Hospital Cook-house.
8. Staff Cook-house.
9. Sisters' Quarters.
10. S.M.O.'s Quarters.
11. Orderlies' Barracks.
12. Mortuary.
13. Destructor.
14. Disinfecting Shed.
15. Soiled Linen Store.
16. Laundry.
17. Native Servants' Quarters.
18 to *25.* Latrines.
26. Sisters' Servants' Quarters.
27. Stable.

and I would go so far as to say that the experiment of destroying all hospital excreta should be tried and, if found economical enough, brought into general use. Then we would be certain that *materies morbi* were destroyed, which we cannot be very sure of with our present disinfecting methods. The recent teaching in regard to enteric fever is that the patient may

remain a source of danger to others for a long time after he is up and about.

If a destructor is within a short distance of the wards the excreta can be taken directly from the patient the instant they are passed and destroyed at once, so as to run no risk of fouling the ground or being carried about by flies, &c. The more usual plan of boiling in a large boiler and after-



PLAN OF DESTRUCTOR.

wards carting away is an ugly, roundabout method, and probably not so cheap as the more thorough and simpler way of immediate destruction by fire. It must be remembered that the excreta themselves when dried act as a fuel.

As the plan explains itself, no further description need be given, except to note that the heavy iron lid is raised by a counterpoise.

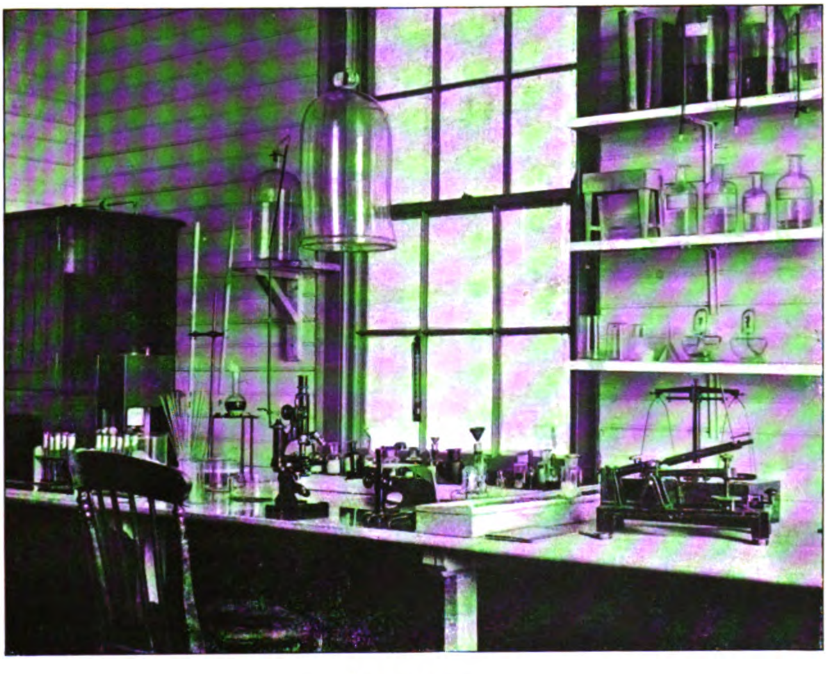
The Laboratory.

This consists of a hut 30 × 24 feet in size, divided into four equal-sized rooms.

The lower photograph shows part of one of the working rooms; the only point to be noted is that a large sheet of plate glass is let into the table opposite the window. This is easily kept clean and is pleasant and smooth to work on.

The fourth room is used as a room for infected animals. Here the floor, sides and shelves are covered with zinc, the joints of which are carefully soldered, so that no absorption of diseased products can take place, and the room is easily cleaned and disinfected.

View of the Four Wards.



Laboratory.

REPORT ON OPERATIONS PERFORMED AT ROYAL INFIRMARY, DUBLIN, DURING 1903.

By Major M. P. HOLT.
Royal Army Medical Corps.

Head and Face.

	Cases	Recovered	Died	Under treatment
Excision of a projecting fragment of frontal bone in a case of old fracture of orbital margin	1	1	—	—
Dissection of a large sebaceous cyst, face	1	1	—	—
Mastoid disease (complete operation)	1	1	—	—
Epithelioma, lower lip; excision of growth and dissection of secondarily enlarged glands of anterior triangle..	1	1	—	—
Removal of sequestra from lower jaw, after compound fracture; old	1	1	—	—
Removal of sequestra from lower jaw, after tooth extraction two years ago	1	1	—	—
Parotid abscess	2	2	—	—

Neck and Chest.

	Cases	Recovered	Died	Under treatment
Dissection of tubercular glands of anterior triangle ..	2	2	—	—
" " " posterior " ..	1	1	—	—
Excision, inner half of right clavicle for extensive necrosis..	1	1	—	—
Gangrenous cellulitis of neck (Ludwig's angina) ..	1	—	1	—
Aneurysm—innominate subclavian, and common carotid; ligature of common carotid and subclavian (3rd part)	1	1	—	—
Extensive tubercular abscesses, neck, opened and scraped	2	2	—	—

Abdomen.

	Cases	Recovered	Died	Under treatment
Liver abscess—single, 1; multiple (5 abscesses), 1 ..	2	2	—	—
Liver explored for suspected abscess, with negative result	1	1	—	—
Malignant disease, rectum, with secondary deposits; ligature of pedicle of large carcinomatous adenoma and removal	1	—	1	—
Laparotomy for tubercular peritonitis	2	1	1	—
Hernia; radical cure	30	30	—	—
Anal fistula	1	1	—	—
Appendicitis, old-standing sinus	2	1	—	1
Hæmorrhoids (internal and external)	3	2	1	—
Aneurysm, aorta and celiac axis; introduction of wire into sac..	1	—	1	—
Perineal abscess in connection with urethra	1	1	—	—
Stricture of urethra with old-standing urethral sinus; dilation of stricture and excision of sinus ..	1	1	—	—

	Cases	Recovered	Died	Under treatment
Restitution of glans penis, for fistulous urethra ..	1	1	—	—
Hydrocele; radical cure	1	1	—	—
Hæmatocele, suppurating; unilateral castration ..	1	1	—	—
Varicocele; radical cure	2	2	—	—
Tubercular testis; castration	3	3	—	—
Traumatic abscess of testicle; castration	1	1	—	—
Nephrolithotomy (three operations on two cases) ..	2	1	—	1
Limbs.				
Reduction, recent dislocation of shoulder	2	—	—	2
,, old-standing dislocations: elbow, 1; wrist, 1	2	2	—	—
,, old-standing dislocation, radius	1	1	—	—
Varicose veins	5	5	—	—
Loose cartilage, knee-joint, removal	1	1	—	—
Amputations.				
Thigh, for sarcoma of leg..	1	1	—	—
Forearm, for extensive laceration and comminuted fracture..	1	1	—	—
Fingers, for extensive crushing	3	3	—	—
Toe, hallux valgus with over-riding toe (second) ..	1	1	—	—
Knee-joint (disarticulation at), old gunshot wound ..	1	—	—	1
Osteoma tibia, excision of tumour	1	—	—	1
Lymphatic glands, thigh; excision	2	2	—	—
,, ,, ,, scraping	1	1	—	—
Periosteal abscess, tibia; opened and drained.. ..	1	1	—	—
Tubercular abscess, forearm	1	1	—	—
,, ,, thumb	1	1	—	—
,, ,, wrist-joint; partial excision ..	1	1	—	—
Gun-shot wounds, arm, old; removal of bullet ..	1	1	—	—
,, ,, knee-joint; removal of piece of bullet	1	1	—	—
Suture of tendons, forearm	2	2	—	—
,, ,, finger	1	1	—	—
Displaced tendon, flexor longus digitorium (ankle-joint); replacement	1	1	—	—
Other minor operations	3	3	—	—

On the foregoing the following comments are submitted:—

The case of excision of clavicle. The patient some three months prior to operation had felt a sudden pain with "something having given way" at the sternal end of clavicle when at gymnasium. Shortly afterwards abscesses in the neck and on the front of sternum followed; these were opened, and as healing did not follow, he was transferred to Dublin. Extensive necrosis of the clavicle and sterno-clavicular joint was made out. The clavicle was divided to the outer side of mid-point, and after careful dissection the inner half of the bone was removed entire subperiosteally. Healing followed satisfactorily, and he

left the hospital with complete free and painless movements of the arm, and a soundly healed scar.

A case of aneurysm of the innominate has already been reported to the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS. Distal ligature was carried out as a preliminary measure, the intention being to complete the cure by subsequent proximal ligature, but the tumour completely disappeared after the distal operation, and after being kept under observation for some weeks, he was discharged to duty. There was a very bad history of recurrent secondary syphilis.

The case of multiple abscess of the liver was subsequent to dysentery, contracted in South Africa, from which he was indeed still suffering intermittently whilst in hospital here. On the first occasion one abscess was opened, and subsequently at various dates four other abscesses were opened in other parts of the liver, all being led into the original opening made by resecting a portion of the eighth rib. Convalescence was naturally prolonged, but eventually he was discharged completely recovered, with the exception of some anæmia. Letters have since been received from him saying there has been no return of liver symptoms.

The case of malignant disease of rectum presented a pedunculated large adenoma which had taken on malignant growth. The tumour protruded from the anus and caused continual distress by reason of its mechanical effects. There was extensive disease of the wall of the rectum, and very extensive secondary disease could be palpated in the liver, so that no further treatment beyond removal of the projecting tumour was possible. The removal of the tumour was a very simple matter. The patient eventually succumbed to secondary metastases.

Two cases of tubercular peritonitis were treated by laparotomy and free flushing by normal saline solution; one recovered and one died. The case recovered reported himself three months later in good health and doing his duty.

Hernia cases: tabulated, they appear as follows:—

Right side	11
Left side	17
Strangulated	2
	30

Kocher's "ideal" operation was performed in	3 cases.
Bassini's ditto	1 case.
Combined Kocher's and Bassini's ditto	25 cases.
Modified Bassini's ditto	1 case.
	30

In the combined Kocher and Bassini's operation the sac is treated by Kocher's lateral transposition, or his invagination transposition method, and this is followed up by treating the entire inguinal canal by Bassini's method. This procedure is recommended in Cheyne and Burghard's "Surgical Treatment," and has been found to produce excellent results. The modified Bassini's operation was performed on a case who had been operated on some eighteen years ago in St. Thomas's Hospital, and who only sustained a recurrence of the hernia when on field service in South Africa in 1900. Radical cure was performed in the two cases of strangulated hernia: in one case a few stitch abscesses formed, but the final result was perfect; in the second case primary union took place with likewise perfect result. In the first case gut was strangulated. in the second, omentum only was found to be strangulated. In the first case the symptoms were of twenty-four hours' duration, in the second they were of four days' duration. The patient was on ordinary furlough, and did not report sick till the evening of the fourth day.

Appendectomy was performed at the same time as radical cure for hernia in two cases; in each case the appendix was herniated, in the first case it was acutely inflamed, and in the second it was nipped within the hernial strangulated sac. (First strangulated case noted above.)

The fatal result in one case of hæmorrhoids deserves notice, since the fatality was only very indirectly connected with the operation. The patient had been operated on on September 5 for external hæmorrhoids. On September 27, as he had complained of some pain on passing motion, and he resisted any attempts at local examination without anæsthetic, it was decided to examine him whilst under ether; this was accordingly administered. Examination revealed nothing abnormal. He suddenly stopped breathing: all efforts at resuscitation were unavailing, though persisted in for one and a half hours. At the *post-*

mortem examination nothing abnormal was found beyond general engorgement of abdominal viscera, large white clot in right ventricle of heart, calcareous rounded bodies, some loose and some attached to choroid plexuses, in the two lateral ventricles of the brain. These have since been prepared and examined by a skilled pathologist, and reported to be true psammomata. In the absence of any definite knowledge as to the pathological effects of these bodies, it must remain uncertain to what extent they operated, if at all, in the fatal result. The death could not be attributed to the already healed pile-bearing area, and deaths due to ether administration are very rare. The anæsthetic was administered by the regular anæsthetist to the hospital, who is specially versed in the use of ether

The case of aneurysm of the aorta and cœliac axis was treated by the introduction of wire within the sac. D'Arcy Power and Colt's apparatus was used and worked perfectly. The patient had no untoward symptoms until the third day, when double pneumonia developed. At *post mortem* there was found septic (aspiration of ether) pneumonia. This result is to be especially regretted, as it is impossible to say how far the introduction of wire would have been successful. The aneurysm sac was found very much contracted and filled with clot surrounding the wire apparatus. The case will be reported in detail in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS shortly.

In the case of perineal urinary fistula, which was one of long standing, the sinus was dissected out entire down to the membraneous urethra, and primary union was obtained; the cure was completely successful.

The two cases of nephrolithotomy were somewhat unusual. The first case was one with a history of symptoms extending over twenty-three years, since patient was a boy of twelve. On cutting into the kidney, a large many-branched calculus was removed from the pelvis of the kidney. The pre-existing chronic pyelitis took some weeks to clear up; drainage of the wound was kept up for forty-eight hours, and then the wound closed without incident. No urine at any time escaped through the wound.

The second case had symptoms dating from a kick received at football some fourteen months previously. The kick was

followed very shortly by a large abscess in the lumbar region, which was opened and drained. Healing did not occur; pus burrowed in various directions, getting exit in the groin and in the chest wall. Eventually the patient was removed to Dublin. At the operation five small renal calculi were removed; it was found to be quite impossible to remove the kidney, owing to the large amount of scar tissue and adhesions fixing the viscus and destroying all the usual anatomical landmarks. Still, healing did not take place, and X-ray photographs showed the presence of two other calculi. At a second operation these were removed. The patient still remains under treatment with a sinus which it is hoped will now be induced to heal.

The amputation of the thigh was done for extensive rapidly growing sarcoma of tibia, following a kick received at football some nine months previously.

The amputation through the knee-joint was done for a case of old gun-shot wound of thigh where the sciatic nerve had been damaged. Resection of the nerve had been performed, and after twelve months the leg remained worse than a useless encumbrance, which the patient wished to have removed.

The amputation through the forearm was done in consequence of a compound comminuted fracture at the wrist-joint and lower forearm. There was such extensive laceration and destruction of all the soft tissues that any other treatment was out of the question in the opinion of all who saw the condition.

A CASE OF DUM-DUM FEVER.

By Major H. B. MATHIAS, D.S.O., R.A.M.C.,
And Major W. B. LEISHMAN, R.A.M.C.

(I.) History of the Case by Major Mathias.

Gunner H. C., R.F.A., aged 24, service, three and a half years, went to India in November, 1901, where he was stationed at Barrackpore near Calcutta. He had good health until the following August (1902), when he was in Hospital for seven days with ague; he was again admitted early the following month (September) with "abscess of the liver," and was operated on for this disease. The entry in his medical history sheet is as follows: "Barrackpore Station Hospital, admitted September 6, 1902. Disease, abscess of the liver. Remarks, single abscess, free incision, excision of piece of ninth rib. Developed symptoms of mental aberration which passed off." There is no record of dysentery and the man himself stated that he had never suffered from it. He was invalided to England in February, 1903, arrived at Netley March 24, and, a week later went on six weeks' furlough. He joined at Newport, May 14, 1903, on the termination of his leave, and reported himself sick the following morning, complaining of sore throat; he stated he had been ill for a fortnight and had been treated at home for tonsilitis.

On admission he looked somewhat anæmic and sallow, but is naturally of a dark complexion. Has a relaxed sore throat, and tonsils slightly enlarged, but not to any great extent; has a scar in the mid-axillary line on the right side, where a portion of the ninth rib was removed when he was operated on, complains of pain in the site of the wound as if a needle was running into him and is unable to lie on that side on account of this pain. The liver is still somewhat enlarged, and the dulness is increased upwards, especially behind. He has a slight cough but no physical signs can be discovered on examining the chest. Temperature on admission 100°; pulse 76, regular. Bowels open, motions appear healthy. Urine, acid, specific gravity 1020, no albumen or sugar. He stated that he had never had syphilis, and there are no signs of this, or of tubercular disease.

From the time of his admission he had an irregular temperature, which persisted although the throat symptoms very quickly passed off. On May 30, or a fortnight after admission, his spleen was found to be enlarged, the edge could just be felt at the costal margin. Early in June a specimen of blood was taken which gave a negative result with Widal's reaction; his blood also showed no marked leucocytosis, nor could any malarial parasites be found in it. He remained much the same until June 20, when he got much worse; his liver became more enlarged, he was slightly jaundiced and complained of the pain in the old scar; he suffered from profuse sweats whenever he went to sleep, and his temperature which had been lower, suddenly rose to 103°. There appeared to be some enlargement of the left lobe of the liver, displacing the colon, and as his condition became very grave, Dr. Vines and Dr. Paton, the latter a surgeon of the Newport and Monmouth Hospital, kindly saw the case with me, and agreed that in all probability the man had some suppuration going on either in or in connection with his liver, and that an exploratory incision should be made in his abdomen, and the pus, if found, evacuated. The man was removed to the Newport Hospital, and on June 27 Dr. Paton performed the operation. An incision 3 inches long was made below and slightly to the left of the ensiform cartilage. The liver was found to be enlarged, and the left lobe to extend right across into the left side, but no abscess could be found either in or around the organ; the spleen was also found to be enlarged. The wound was then closed. At this time his condition was desperate and he was not expected to live from day to day. The wound did not heal well, the spleen enlarging now more rapidly, causing tension on the stitches in the wound; eventually, however, it healed well, and he made a good recovery as far as the operation was concerned. As soon as he was fit to move he was brought back to the Station Hospital, and from that time until his death his condition was one of progressive asthenia, characterised by pallor and great emaciation, and at times he was very despondent.

On December 14, 1903, his feet and legs became swollen and œdematous, and he took to his bed, and from this time onwards did not leave it. Localised œdema of a transient character was frequent, affecting the left leg, scrotum and left eyelid; there

was a tendency for bed-sores to form on his back and hips, and this was only avoided by very careful nursing and an air bed. On January 5 he had a fit at 1 p.m., whilst eating his dinner, epileptiform in character, which lasted about three minutes, and which left him in a more or less comatose condition, suggestive of cerebral thrombosis, and in this state he remained until the day before his death, when he appeared better and spoke, saying he felt all right; he, however, had another fit that evening at 9 p.m., and died at 4 a.m. the following morning. There had been symptoms of partial paralysis of the left side of face and left arm for the last few days of his life, also internal strabismus left eye, and he passed all his motions under him.

Temperature. — His temperature ran a very irregular course throughout (chart attached), but as a rule there was an evening rise and a morning fall; this was not by any means constant, the morning temperature being occasionally the higher. The charts show periods of apyrexia, and it was noticeable that at these times the spleen diminished in size.

Pulse. — The pulse varied with the temperature and was usually between 80 and 100 until the last fortnight of his illness, when his temperature became subnormal, and the pulse rate fell to 70. Hæmic murmurs were occasionally heard over the cardiac area, and on one occasion he had an intermittent pulse (every fourth beat), but this only lasted twenty-four hours.

Respiration. — His respiration was slightly affected from the commencement. There was a tendency to bronchial catarrh; harshness of expiration and crepitation were present at apex of right lung with slight diminution of resonance on percussion during the months of October and November, but this cleared up.

Hæmorrhages.—Small hæmorrhages took place from the lips and gums, but not to any extent; he had two or three attacks of epistaxis but not of any large amount; there was more frequent oozing of blood in small quantities from both nostrils. He had a well-marked attack of hæmaturia towards the end of his illness, and blood cells were found in his urine for some time before this.

Blood.—The blood was examined continually during the progress of the disease; no parasites, malarial or otherwise, could

be discovered; there was no leucocytosis or poikilocytosis at any time. Blood counts were made during the months of September and October, 1903. These showed: red corpuscles, 3,500,000; white cells, 8,000. The white count was made on four or five different occasions with the same result. A specimen of blood (film) was also sent to the Royal Army Medical College Pathological Laboratory (January 6, 1904). Major Leishman, R.A.M.C., examined it and reported "No abnormal cells, no nucleated red corpuscles or myelocytes, no leucocytosis or alteration in the shape of cells. Percentage of the various leucocytes :—

Polynuclears	Large Mononuclears	Lymphocytes	Eosinophiles
52	14·5	33·5	0

Spleen.—The condition of the spleen was very interesting; it gradually enlarged until the end of October, when it began to decrease. At the end of September it crossed the middle line above the umbilicus by 1½ inches, and extended down to nearly the crest of the ilium; it gradually decreased in size during the month of November, more rapidly during December, until shortly before death it could only just be felt below the costal margin, being from 1 to 1½ inches below it. He never complained of any pain in the organ nor was it at all painful on palpation until the last month, when it was evidently very tender. This was, however, I think due to the diminution in size of the spleen dragging on adhesions formed in connection with the scar in the abdomen.

Liver.—The liver also underwent changes in size, but not to anything like the same extent as the spleen; it was probably larger at the time of the operation than at any later period. He had jaundice twice, the conjunctivæ being distinctly yellow, but this soon passed off.

Digestive system.—He took nourishment extremely well, and on the whole his appetite was very good, becoming somewhat capricious towards the end of his illness; he, however, ate solid food up to within a week of his death.

Skin.—His skin presented a peculiar saffron-coloured tint due to anæmia; a few purpuric spots made their appearance shortly before his death. No glandular enlargements (beyond those mentioned) could be discovered at any time.

Tongue.—Was generally moist and clean, except when the temperature ran very high, when it became dry and brown.

Bowels.—Were constipated at the commencement of his illness, requiring enemata and laxatives; latterly he suffered from diarrhœa, having four or five motions in twenty-four hours. He never had melæna, and his motions appeared healthy and bile-stained, except on the two occasions when he had jaundice. There was considerable distension of the upper part of the abdomen before he was operated on, and also before his death, and the veins of the anterior abdominal wall and chest became distended; there was also evidence of fluid in the peritoneal cavity.

Eyes.—His eyes were examined and found to be normal. No change in the fundus.

Urine.—His urine was examined from time to time: at first it was normal, latterly, during the month of December, it always contained albumen, about one-third; blood cells and epithelial casts were found microscopically, and there was distinct hæmaturia at the time he had the fit.

Treatment.—Exploratory opening of abdomen.

Drugs.—Quinine given in grs. x. doses. He took as much as xxv. to xxx. grs. a day with no effect on the temperature. Arsenic, beginning with liq. arsenicalis ♏. v. increased to ♏. x. three times a day after food, continued for long periods, was discontinued in December as it did not appear to have any influence on the disease. Iron given alternately with the arsenic, calcium chloride and iodide of potassium. Bone marrow was also given raw and in the cooked state.

Neither drugs nor dietary seemed to make any difference to the course of the disease.

Post-mortem examination, ten hours after death, made January 13, 2 *p.m.*—Rigor mortis present. Body much emaciated; skin saffron coloured, purpuric spots on arms and legs; muscles anæmic; scar of operation wound in right side on level of ninth rib; scar of operation wound 3 inches long in abdomen below ensiform cartilage.

Thorax.—On opening the thorax the pericardium was found to contain several ounces of a straw-coloured fluid.

Heart.—9¼ oz., small, muscles anæmic, valves healthy.

Right Lung, 25¼ oz.; no adhesions; slight engorgement at

base, otherwise appeared to be healthy; no signs of tubercular disease.

Left Lung, 19½ oz; no adhesions, appeared healthy.

Abdomen.—On opening the abdomen 20 oz. of clear serum were found; the intestines had a peculiar translucent appearance, and the mesentery an œdematous look.

Mesenteric glands were enlarged and pigmented; towards the duodenum they were especially numerous.

Pancreas.—Weight 5½ oz.; enlarged and hard; more intimately adherent to the duodenum than usual.

Liver, 75 oz.; enlarged, especially the right lobe; the left lobe extended right across to the left side of the body. It was adherent to the old operation scar in the right side and also to the spleen; was of a maroon colour, tough on section, especially the right lobe, mottled in appearance; liver substance divided into large lobules by wavy, thick, pigmented lines. No sign of abscess or gumma, nor could any remains of an old abscess cavity be found.

Gall bladder contained about ½ oz. bile; appeared healthy.

Spleen, 43 oz.; much enlarged, extended from 1 to 1½ inches below the costal margin, congested, and very friable; no sign of abscess, infarct or gumma.

Right kidney, 7½ oz.; capsule not adherent, very pale in colour in patches; is somewhat tough on section; pigmented in places, with a mottled appearance.

Left kidney, 8 oz.; capsule slightly adherent, enlarged, pale-coloured areas showing through the surface; these were slightly tougher on section than the remainder of the organ, which had the same mottled appearance as the right.

Intestines.—Beyond the translucent appearance previously noted the intestines appeared healthy, and no signs of old ulceration existed in either the large or small intestine.

Bladder contained about one pint of urine, normal.

Brain, 47½ oz.; membranes congested; some patches of organised lymph on the brain surface on each side of the longitudinal sinus; choroid plexus congested, otherwise the brain appeared normal. No thrombosis could be found. There was no excess of cerebro-spinal fluid.

(II.) Remarks on the Case by Major Leishman.

On January 7, 1904, I received from Major Mathias some blood films from this case, together with a short abstract of

the history and present condition of the patient. The result of this blood examination is incorporated in his description, but it occurred to me, on reading the abstract, that, while there was little evidence for or against a diagnosis of that very vague disease "splenic anæmia," there were many points in which the case resembled those which I have elsewhere described as "Dum-Dum fever." In mentioning this to Major Mathias I suggested that, if possible, he should obtain samples of the patient's blood from the spleen by puncture of that organ with a view to determining the presence or absence of the parasitic bodies which I found in one of these cases at Netley in November, 1900. This he kindly undertook to do, but, unfortunately, owing to the retraction of the spleen below the ribs, which he describes above, the operation was postponed and death took place before the organ was again in an easily accessible situation.

At the necropsy Major Mathias made smears from the liver and spleen and forwarded them to me, together with portions of these organs, for examination. The parasitic bodies were easily detected in the smear preparations, both from the liver and the spleen.

In the spleen smear, stained by Romanowsky's method, the bodies were most numerous, averaging two or three in a field (Zeiss Apochrom. $\frac{1}{12}''$ Obj. and No. 6 Comp. Ocular.), and they presented the same appearances as those I described in the original case already alluded to; small, more or less definitely circular, chromatin masses, 1·5 to 2 μ in diameter, while close to each lay a smaller body, most frequently in the form of a short rod, but occasionally in that of a dot, and so intensely stained as to appear almost black. This smaller body was seldom in actual contact with the larger, and was often situated at an angle to the larger mass, somewhat like an accent on a small letter o, thus (ó). In a few instances a pale, blue-staining stroma, oval in shape and 3-4 μ in its longest diameter, was seen enclosing both chromatin bodies, the larger of which was always closely applied to the periphery of this blue-staining stroma. In most cases, however, this stroma was absent, or, at least, unstained, and the parasitic bodies appeared to be lying free among the spleen cells and the red blood corpuscles. In no instance was a parasite found *in* a red blood corpuscle.

In the smear from the liver the parasites were fewer in number and were mostly found lying in the protoplasm of large mononuclear cells, probably the hepatic cells. In this situation they presented the same appearance as those found in the spleen. The capsulated forms I have seen in Donovan's specimens and the so-called zooglea masses figured by Ross, Laveran, Manson and Marchand, were not found in this case.

Sections of the liver showed a profound disorganisation of the hepatic tissue, the hepatic cells being to a large extent absorbed and their place taken by a loose, fibrous stroma, poor in cellular elements. In the dissociated columns of hepatic cells lying in this tissue many of the individual cells were seen to have undergone a marked fatty degeneration of their protoplasm, while in others the protoplasm had shrunk to a narrow band surrounding the nucleus. The portal and hepatic vessels showed some thickening of their walls, and surrounding some of them was a zone of round-celled infiltration. The presence of the parasites could not be clearly demonstrated in the sections as satisfactory chromatin staining is not possible in hardened tissues.

The sections of the spleen showed a general condition of hyperplasia with some thickening of the capsule; here, too, the parasites could not be made out with certainty. No pigment was found either in the spleen or the liver.

With regard to the symptoms of the case recorded by Major Mathias, these present many features in common with the other cases in which these parasitic bodies have been found, whether by spleno-puncture during life or *post mortem*, and a brief summary of these symptoms and signs may be of service in the detection of further cases and in the extension of our knowledge of the actual nature of the parasite and its possible pathogenic relationship to tropical splenomegaly. On both of these points we are, at present, much in the dark, and the subject offers a promising field for investigation.

(1) *Splenic enlargement.*—This occurs early and seems a constant feature. The enlargement is usually very great, and appears to be frequently accompanied by pain. The fluctuation in size recorded in this case has not been mentioned before.

(2) *Hepatic enlargement.*—A certain degree seems always to accompany the splenic enlargement. In this case the previous

history of liver abscess obscured the diagnosis. The enlargement of the liver is important in view of the fact that, in most instances, the parasites have been found in this organ as well as in the spleen.

(3) *Cachexia.*—The peculiar earthy pallor of the skin and the intense degree of emaciation which accompany the later stages of the disease are very striking.

(4) *Temperature.*—The long-continued, irregularly remittent or intermittent charts furnished by these cases are in themselves characteristic in the absence of any other definitely ascertained cause for the almost constant pyrexia.

(5) *Hæmorrhages.*—Epistaxis, bleeding from the gums, &c., have been mentioned in many of the recorded cases and formed a marked feature in this instance.

(6) *Purpuric eruptions and subcutaneous hæmorrhages* have also been mentioned and are once more in evidence in this case.

(7) *Transitory œdemas* of various regions or of the limbs appear to be frequent and are especially mentioned by Donovan in connection with his cases.

(8) *Headache.*—Severe and persistent headache is not uncommon.

(9) *Effects of Medication.*—In none of the cases so far recorded have drugs proved of any service in modifying the course of the disease.

(10) *Complications.*—The frequency with which congestion of the lungs, diarrhœa and dysentery appear in the course of the disease is noteworthy.

(11) *Blood count.*—In several cases a large increase in the relative proportion of the large mononuclear cells, unaccompanied by a general leucocytosis, has been observed, the figure reaching 14 per cent. or even higher. This, if confirmed by further experience, is interesting in view of the importance which has of late been attached to an increase of these cells as affording evidence of recent malaria.

These, then, form the chief points presented in common by the cases in which the presence of the parasites has been demonstrated, either *intra vitam* or *post mortem*, by Donovan, Manson and Low, Marchand and Leddingham, and by myself. We must, of course, await the results of much more extended observation before accepting these parasites as the actual cause

of the disease in question, but the uniformity of their occurrence in a series of cases presenting so many symptoms in common is, to say the least, suggestive.

In my original communication I suggested that search should be made for these parasitic bodies in Kala Azar, which appeared to me to present a clinical picture closely resembling that of Dum-Dum fever, and it is interesting to learn that Dr. C. A. Bentley has recently telegraphed from Assam that he has found them in the spleen in this disease. A comparison of the list of symptoms detailed above with those of Kala Azar--of which a good account was given by Dr. Bentley himself at the meeting of the British Medical Association in 1902—will, I think, show that, as far as symptomatology goes, the two conditions are practically identical, and the conclusion can hardly be avoided that Dum-Dum fever may eventually prove to be no more and no less than Kala Azar. Should this be so we must then acknowledge that endemic foci of this disease exist in and near Dum-Dum, in Madras, and probably in many other parts of India, where its existence has been unsuspected hitherto, and, further, that it has in the past taken its toll of many a British soldier whose death has been attributed to Malaria.

Postscript.—A list of the articles published upon this subject will be found in the *British Medical Journal* of February 6, 1904, page 303.—W. B. L.

REPORT OF A CASE OF DUM-DUM FEVER.

By Major C. T. BLACKWELL.
Royal Army Medical Corps.

Personal History.—Pte. T. C., aged 24, was formerly a labourer, and enlisted on February 2, 1897, at Belfast. In February, 1898, he was sent to South Africa, and from there he was transferred in April, 1899, to India, and his first station was Dum-Dum. He was then moved to Barrackpore; he returned to Dum-Dum, but only for a short period, and was then ordered to Calcutta. He then served at Darjeeling, but returned to Calcutta in March, 1900. His next station was Fyzabad, and from there he was invalided to England.

Medical History prior to Admission into Netley Hospital.—When in South Africa, and stationed at Ladysmith, he had an attack of dysentery; but it lasted only fourteen days. He had ague in September, 1899, and was in hospital for ten days. Patient described a typical attack of ague. He said that the initial attack came on suddenly whilst he was walking in the street in Calcutta. He felt suddenly cold and shivery, and rapidly got colder. He went indoors and lay down, covering himself with blankets, but he only got colder, and began to feel giddy and sick. This lasted for about an hour, and then he gradually got warmer and vomited; he became very hot, and then sweated profusely, and felt much better, and later on he went to hospital. The next day he had a similar attack, then missed a day, and then had another attack; after this he had four or five days free from fever, followed by another but somewhat milder attack, and then he became convalescent.

When at Darjeeling, in 1900, he had another attack of malarial fever, which lasted fourteen days; but from this time he had no illness of any sort until, on August 30, 1902, he was admitted into hospital at Fyzabad suffering from enteric fever. The attack is described as a severe one, and lasted 160 days. He was then discharged from hospital, but directed to attend, as he was debilitated, and it was intended to send him to the hills for the ensuing hot weather; but on Feb-

ruary 27, 1903, he was re-admitted into hospital, as the anæmia had become much aggravated. His condition then is described as being very pale and bloodless, but that he had not lost flesh; heart's action was weak and irregular, pulse very compressible, temperature rising daily, but not above 101°, and always normal in the morning; spleen greatly enlarged and tender, while occasionally he had severe attacks of pain in this region; liver slightly enlarged. He complained of severe headaches and distressing throbbing in the temples and breathlessness on exertion.

He was brought before an Invaliding Board on April 6, 1903, and left India by the s.s. "Sardinia," arriving at the Royal Victoria Hospital, Netley, on May 5, 1903. On admission at Netley his condition was as follows. His figure was inclined to stoutness, his features were rather full, complexion was pale, pasty and rather sallow; his sclerotics were pearly; pupils were bright and conjunctivæ had a slight icteric tinge. He had that anxious, strained expression so often seen in those who have an enlarged liver or spleen. On slight exertion he became very breathless. Spleen was greatly enlarged, and extended downwards and inwards, and reached to the umbilicus, and it was somewhat tender on palpation. Liver was slightly enlarged and tender. He then appeared to be free from fever, but shortly afterwards he had what appeared to be an attack of ague. An examination of his blood showed, however, no malarial parasites present, but the red corpuscles showed great irregularity in size and shape. The attached chart shows the very irregular temperature during patient's illness; his own sensations were not influenced by the degree of fever as much as one would have expected, for often when he had high fever he described himself as being comfortable and getting better.

On June 8, 1903, a blood count gave:—

Polynuclears	Lymphocytes	Large Mononuclears	Intermediate Forms
41 %	27 %	13·4 %	18·6 %

The red cells were very pale, there was considerable poikylocytosis and leucocytes were scarce. No malarial parasites present (see note at end).

Early in July, 1903, patient began to complain of piles, and they troubled him more or less during the remainder of his illness. All through his illness he frequently had attacks very

like ague. He felt chilly and shivery, and would have the bedclothes piled over him; he then would sweat profusely, and feel greatly relieved by it, and his temperature would drop, sometimes to sub-normal.

Patient's condition slowly got worse, the anæmia became more pronounced; his lips and fingers became greatly blanched, his spleen slowly increased in size, and the area of dulness extended 2 or 3 inches below level of umbilicus, and the organ appeared on palpation to be getting denser and more resisting as the disease progressed. The area of liver dulness was greatly increased; the upper border in the nipple line reached to the fourth rib, and in the mid-axillary line to the sixth rib. At this period of his illness (end of July) the liver did not reach below the costal margin, but, towards the end, the margin of the liver was about an inch below the point of the ninth rib, and could be very distinctly felt, while the whole area of dulness was greatly increased. Respiratory sounds were normal, but, owing to the thorax being so greatly encroached on by both liver and spleen, and also on account of the anæmia, the respirations were always very hurried and shallow. Heart sounds were normal, but more rapid than usual, and the rate varied greatly with any slight exertion; pulse was compressible; there was no thickening of the arteries. Urine always contained a small amount of albumen, but otherwise appeared to be normal.

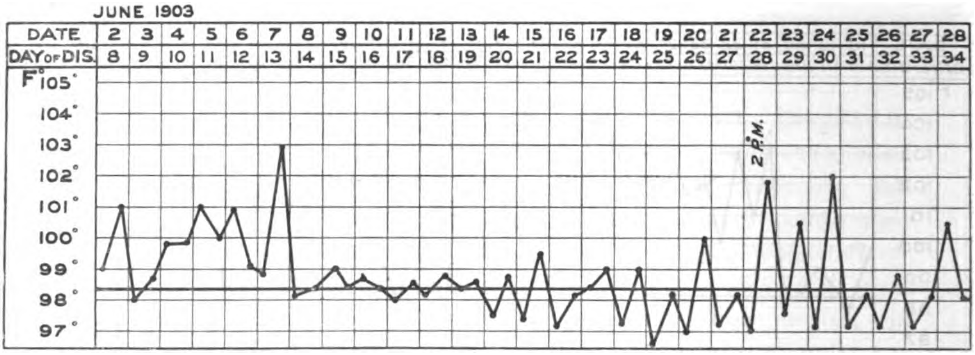
In September, 1903, a blood count gave the following:—

Polynuclears	Lymphocytes	Large Mononuclears	Intermediate Forms
42·5 %	27·5 %	13·5 %	16·5 %

No malarial parasites.

The peripheral blood was frequently examined for Leishman's bodies, but none were found; and also for enteric and Malta fever reactions, but with negative results; and also for trypanosomiasis, and the fæces for *Ankylostoma duodenale*, but without success. In November, 1903, patient began to be troubled with œdema of the legs. This was much increased by walking, but was controlled by patient spending a longer period of the day in the recumbent position.

In the end of December he had several attacks of vomiting, but it was thought this was due to indiscretions in eating, and the sickness ceased when he took a lessened dietary; seeing that the inevitable end was rapidly approaching one did not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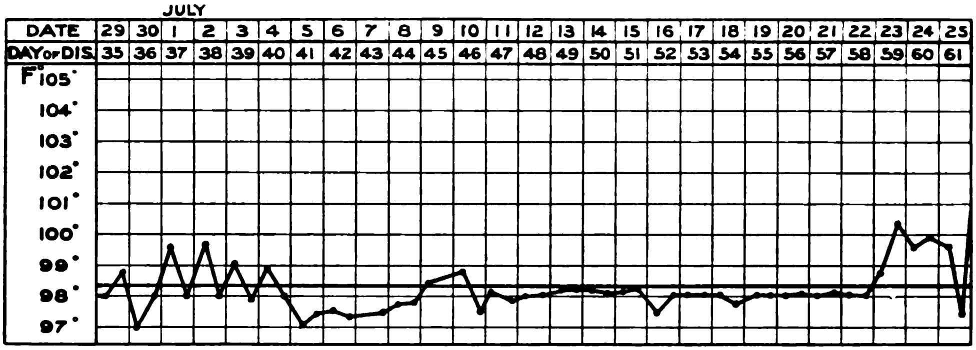
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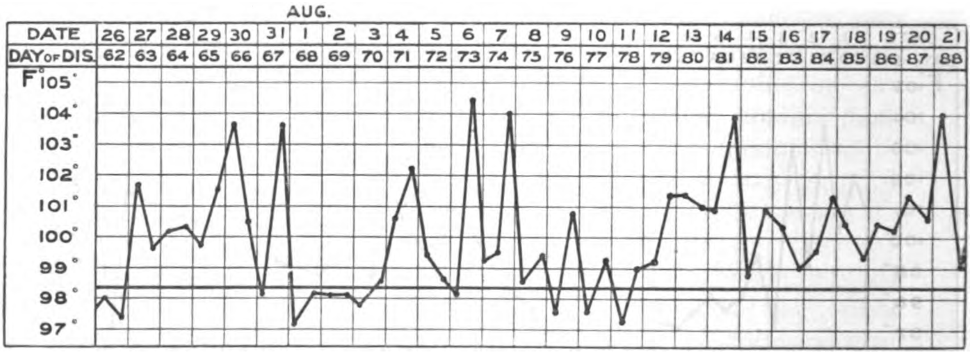
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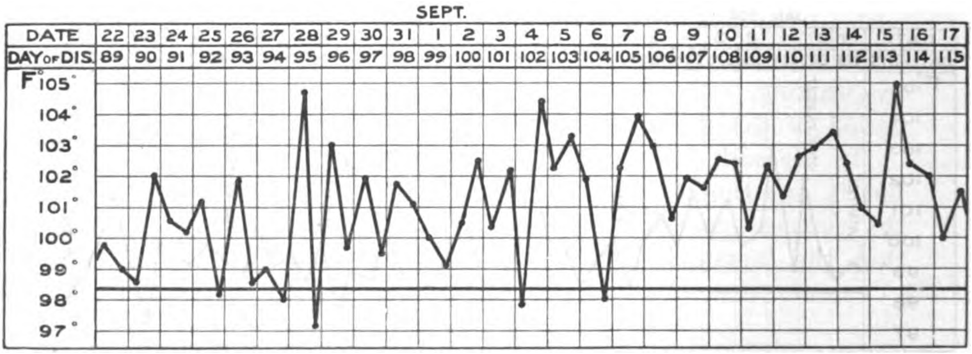
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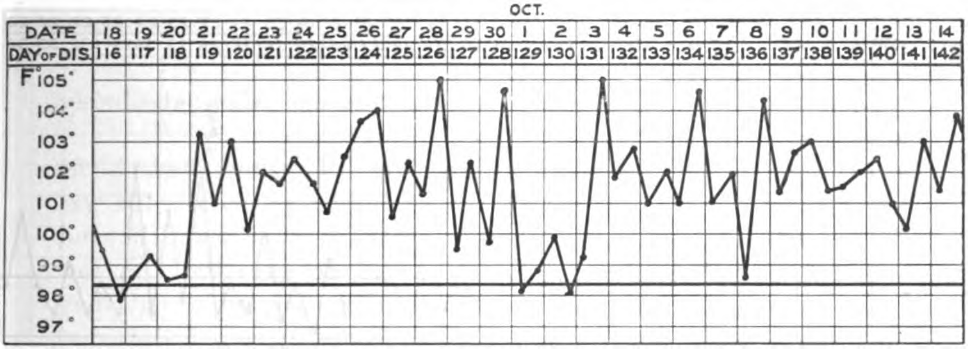
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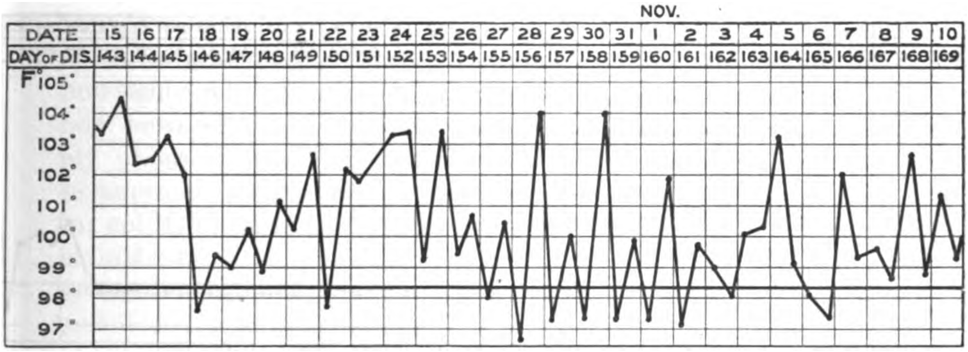
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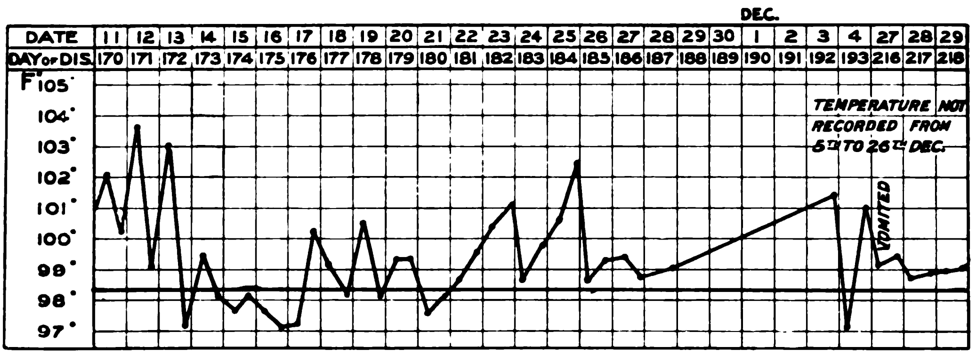
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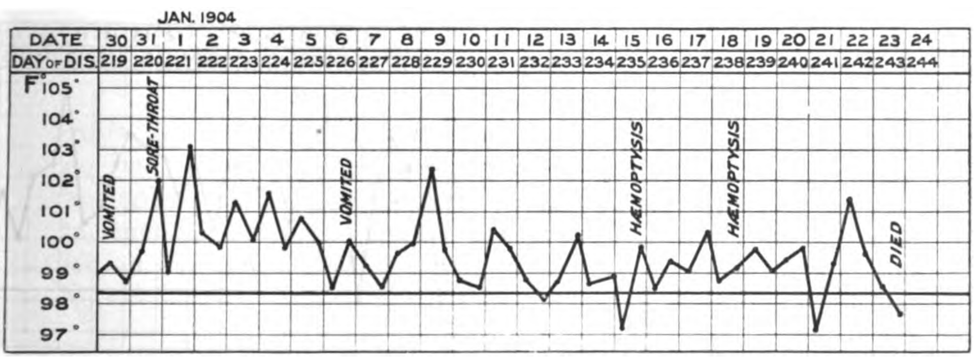
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VOMITED
SORE-THROAT
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HÆMOPTYSIS
HÆMOPTYSIS
DIED

like to thwart him in his inclinations except when absolutely necessary.

On December 31 he complained of sore-throat, which he attributed to a chill he got when out in the grounds. He was also troubled by a cough, but the lungs appeared sound beyond the hypostatic congestion, which was to be expected. A few purpuric spots appeared at this time on his left ankle, but they did not increase in size, and no fresh ones appeared.

On January 15, 1904, he had an attack of hæmoptysis; the quantity of blood lost was about 6 ozs., and this weakened him considerably.

On January 18 he had another slight attack; the congestion of lungs did not appear to be increasing; chest in front and behind was resonant, and respiratory sounds were normal. He appeared to regain his usual condition; but on the morning of January 22 there was a marked change in the condition of patient, the pallor was extreme, and there was considerable dyspnœa; he did not however complain of anything beyond feeling a little weaker than usual. His condition gradually got worse, and he died on the morning of January 24, 1904.

Treatment.—Many drugs were tried, and from some it appeared that patient benefited, but a further experience showed that the apparent improvements were due to the varying condition of patient during his illness, and finally nothing was given except to relieve symptoms. Amongst the drugs prescribed were quinine, arsenic, iron, iodide of potash, perchloride of mercury, calomel, salicylates, &c. Patient was frequently seen by all the medical officers stationed at Netley.

Post-mortem Examination Twelve Hours after Death.—The body was that of an adult, well-nourished man; skin was somewhat œdematous and very white.

Thorax.—Both lungs behind were infiltrated and congested, and showed many exudations of a hæmorrhagic character; heart was normal; no atheroma and no ulceration. Mediastinal glands were slightly enlarged.

Abdomen.—The spleen was enormously enlarged, and there were many patches of a yellow colour, white infarcts, and on section these appeared to be surrounded by a narrow margin of hæmorrhage. On removing the spleen, a large amount of blood escaped from it. Weight was 7 lbs. Liver was in the

so-called nutmeg condition and greatly increased in weight (6 lbs. 9 ozs.). There was no ascites; kidneys were normal; pancreas normal. All the structures of the body were very anæmic.

Note by Major W. B. Leishman, R.A.M.C.

In the case reported by Major Blackwell, I found in the *post-mortem* smears from the liver and spleen, which he was good enough to send me, the same parasitic bodies which I have described in connection with Major Mathias' case. The parasites presented the same appearance, and sections of the liver and spleen showed the same histological characters as in that case, with the exception that, in Major Blackwell's case, the parasites were more numerous in the liver than in the spleen, many of the large mononuclear cells containing from ten to fifteen parasites.

With regard to the history of an attack of enteric fever at Fyzabad, lasting 160 days, the absence of a positive reaction to Widal's test on admission to Netley, little more than two months later, suggests that this prolonged fever may have possibly been due to the disease from which he died. No cicatrices were found in the ileum at the necropsy.

III.—CLINICAL URINARY ANALYSES.

By Capt. J. C. B. STATHAM.
Royal Army Medical Corps.

As it has been suggested to me that fuller notes on the detail of methods employed in quantitative work might be useful to any interested in the subject, or likely to take it up, I have put together from my notebooks the methods which have been found the most practical and simple, yet of sufficient accuracy for all clinical purposes. The notes have been gleaned from many sources, and considerable time and trouble has been expended in the selection of methods.

Until quite recent years quantitative urinary analysis has been too complicated and laborious to be undertaken by any but the analytical chemist or those engaged in researches on chemical physiology and pathology. Now, however—chiefly abroad—great attention is being paid to quantitative urine work, as its importance is being recognised. I have worked with a view to helping in the process of simplifying quantitative methods, believing that with simple yet reliable methods will come the workers who are most wanted—the doctors in charge of cases. None of the methods given in the paper are long except three—those for the sulphates, uric acid and purin bodies; and these three methods will, I hope, shortly be abandoned for one of the centrifugal methods foreshadowed in this paper. I hope when the necessary tables for these processes have been completed that it will be possible to finish a complete quantitative urinary analysis in one hour, including the estimation of the total nitrogen, extracts, acidity, urea, uric acid, purin bodies not uric acid, preformed ammonia, phosphates, chlorides, sulphates both preformed and conjugated, and the urobilin.

I venture to think that an hour so spent and results so obtained will by the insight given into the inner working of that complex factor, the human body, repay the labour expended.

Estimation of Urinary Acidity.—The total acidity of urine may be estimated in many ways; but as the results obtained

by different procedures differ considerably, whichever method is adopted should be adhered to for all analyses.

The simplest method is to titrate a given quantity of urine, say 20 c.c., with a decinormal alkaline solution, till a drop of the titrated urine turns neutral litmus paper slightly blue. The number of c.c. of decinormal solution used, say x multiplied by $\frac{1000}{20}$, and by $\frac{1}{10}$, *i.e.*, by 5, will give the amount of urinary acidity per litre of urine in terms of normal alkaline solution.

A more satisfactory and still simple method is that introduced by Folin; it is based on the principle that phenolphthaleine, which while otherwise an unsatisfactory indicator in estimating urinary acidity, owing to its slow end reaction in the presence of ammonia salts in the latter, is rendered an eminently satisfactory one when these are removed by the addition of an oxalate of potassium.

The oxalate of potassium also precipitates any calcium salts present, which, by combining with the P_2O_5 to form basic phosphates and liberating free phosphoric acid, increase urinary acidity. To determine the total acidity, place 25 c.c. of urine in a flask (dilute if the urine is high coloured), add a few drops of phenolphthaleine, and from 15 to 20 grms. of oxalate of potassium, agitate the flask well and titrate *at once* with a decinormal alkaline solution till a faint rose colour is obtained. The number of c.c. of decinormal alkaline solution used, multiplied by 40 or by 4, will give the amount of urinary acidity in terms of decinormal and normal alkaline solutions respectively.

The Extract.—The urinary solids may be estimated by evaporating and drying a small quantity of the urine over a water-bath, and then weighing; but this is a long and laborious process, and a much simpler and perhaps equally accurate one is to take the specific gravity in a specific gravity bottle or Westphaal's balance (urinometers are hopelessly inaccurate), and multiply the last two figures by Häser's coefficient (2·33) to obtain the solids per litre.

The Westphaal balance (fig. 1) is based on the principle that a body immersed in a liquid loses a part of its weight equal to the weight of the displaced liquid.

The apparatus consists of a beam balanced on a stand. The free end of the beam has a hook from which a glass plummet is suspended; the other end of this beam ends in a point, which when the machine is regulated is exactly opposite a projecting point on the stand. The upper edge of the beam is divided by notches into a graduated scale, on which various-sized riders representing hundred, ten and unit weights respectively may be placed. The balance, with the ten weight placed on the hook at the end of the beam, is balanced exactly if distilled water is placed in the glass, the head of the plummet then remaining just immersed in the water.

If urine be placed in the glass instead of water the balance will be upset, and riders of various sizes will have to be placed on the notches of the beam to redress it. The size of the riders required and the notches in which they will have to be placed to restore the balance (*i.e.*, bring the two points shown in the picture opposite each other) will give the specific gravity of the urine.

The balance is standardised for a temperature of 15° C., and Purdy recommends that one figure should be added to the specific gravity found for every 7° of temperature above 15° C.—say specific gravity at 22° C. is 1019 $\therefore$ true specific gravity is 1020. The last two figures, multiplied by 2·33 (20 × 2·33), equals 46·6, the amount of solids present per litre of urine.

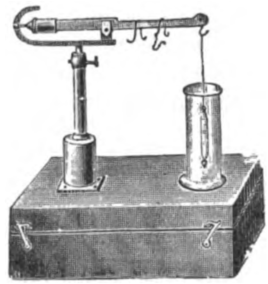


FIG. 1.—WESTPHAAL'S BALANCE.

N.B.—For this Figure, as well as for figs. 2, 5 and 6, I am indebted to Messrs. Baird and Tatlock, of Cross Street, Hatton Garden, who very kindly lent me the woodcuts.

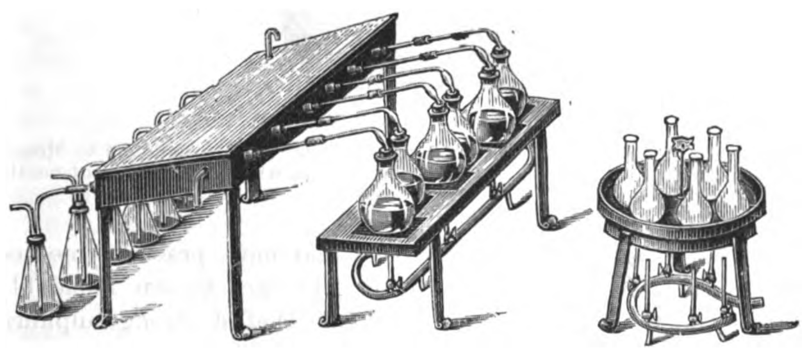
The Total Nitrogen.—The simplest and most practical method of estimating urinary nitrogen is by the well-known Kjeldahl's method, which is based on the principle that if strong sulphuric acid be added to a nitrogenous fluid and heated, ammonium sulphate, carbonic acid and water are formed. The ammonia can be recovered from the ammonium sulphate by distillation, and estimated. From the amount of the NH_3 present the N. can easily be calculated.

Procedure.—To 5 c.c. of urine in a long-necked flask add 10 c.c. of strong sulphuric acid and 5 c.c. of a 30 per cent. solution of neutral oxalate of potassium (which hastens the action of the sulphuric acid on nitrogenous matter). Place a balloon-shaped stopper in the flask mouth to prevent loss of the sulphuric acid fumes formed on heating the flask. Heat at first moderately and afterwards strongly, till the fluid in the flask is decolourised. The flasks used for boiling are seen on the right-hand side of the accompanying illustration.

Now cool the flask and add distilled water slowly, to 200 or 300 c.c., add a few drops of phenolphthaleine or other indicator to the acid fluid,

and then an alkaline solution such as a 20 per cent. caustic soda, till the indicator shows that the fluid is now decidedly alkaline. Attach the flask to a distilling apparatus (such as that seen in the picture), into the receiving flasks of which 50 c.c. of a decinormal solution of sulphuric acid has been placed. Now heat the flask containing the alkaline ammonia solution and allow the ammonia to distill over into the $\frac{N}{10}$ acid solution. Titrate the acid solution after all the ammonia has distilled over, against a $\frac{N}{10}$ alkaline solution. The moment when the ammonia distillation is complete may be determined by applying some litmus paper to the tube of the distillation apparatus where it enters the flask containing the sulphuric acid. Each c.c. of $\frac{N}{10}$ acidity lost by the distillate represents 0·0017 gr. of ammonia and 0·0014 gr. of nitrogen.

Example.—After receiving the ammonia distilled from 5 c.c. of urine, 50 c.c. of a $\frac{N}{10}$ acid solution were neutralised by 20 c.c. of a $\frac{N}{10}$ alkaline solution; ∴ 30 c.c. of $\frac{N}{10}$ acidity lost; each c.c. = 0·0014 nitrogen; ∴ 30 c.c. = ·042 gr. nitrogen in 5 c.c., or $\frac{\cdot 042 \times 1000}{5} = 8\cdot 4$ grm. nitrogen per litre of urine.



a. *b.*

FIG. 2.—KJELDAHL'S APPARATUS. *a*, Distillation apparatus; *b*, boiling flasks.

Urea.—The most rapid method of estimating urea has already been described in my first paper. Another method which while not nearly so rapid, is perhaps even more accurate, is that recently devised by Folin. This process depends on the fact that urea when heated along with magnesium chloride breaks up into an ammonium salt;* the amount of the latter

* N.B.—This break-up of the urea is not due to a chemical union with the magnesium chloride evidently, but to the high temperature at which magnesium chloride boils when dissolved in its water of crystallisation alone (viz., 160° C.), causing a complete break-up of the urea to ammonia.

can easily be estimated, and from it the original amount of urea in the sample calculated.

Procedure.—Three c.c. of urine are placed in a 200 c.c. flask, the rubber cork of which is pierced by a glass condensation tube six or eight inches long. Twenty grms. of magnesium chloride and 2 c.c. of pure hydrochloric acid are added. The flask is now heated gently until the magnesium chloride dissolves in its own water of crystallisation, and then more briskly for ten minutes. Loss of water from the already highly concentrated solution is prevented by the glass tube, which condenses the steam and causes the drops of water so formed to drop back into the boiling fluid. When the drops of water falling back into the flask do so with a hissing noise, the flame under the flask is reduced, and the fluid boiled gently for half an hour. At the end of this time all the urea has been converted to an ammonium salt. After the flask has cooled somewhat, the ammonia is estimated by adding 500 c.c. of distilled water and an excess of alkali (8 or 9 c.c. of a 20 per cent. solution of caustic soda), and distilling the ammonia over into a known quantity of decinormal acid solution, as in the Kjeldahl process just described. The next step is to estimate the amount of acidity lost in the decinormal acid solution through the presence of the ammonia by titrating this with a decinormal alkaline solution. Before doing so, however, the acid-ammonia solution should be boiled to drive off any carbonic acid brought over by the distillation.

As by this method the preformed ammonia is included in the result, it must be eliminated by (1) estimating the preformed ammonia by Shaffer's process and deducting its amount from the amount found here; or (2) precipitating the ammonia along with other urinary nitrogenous bodies by aid of a 10 per cent. solution of phosphotungstic acid. If very accurate results are required the latter method is probably the best, as undoubtedly small amounts of the creatinin and other extractives appear to be broken up to ammonia by the action of the magnesium chloride and high temperature. Each c.c. of decinormal acid solution neutralised by the ammonia distilled over represents 0·0017 gr. of NH_3, 0·0014 gr. of nitrogen, and 0·0060 gr. of urea.

Example.—The ammonia given off by the 3 c.c. of urine neutralises 9 c.c. of decinormal acid solution: ∴ 1 c.c. would neutralise 3 c.c. of decinormal acid solution: ∴ 1,000 c.c., or 1 litre, would neutralise 3,000 c.c. of decinormal acid solution. Now 1 c.c. of decinormal acid neutralised = 0·0017 gr. ammonia and 0·00060 gr. urea: ∴ the amount of ammonia and urea per litre of urine would be 0·0017 × 3,000, or 5·1 grammes ammonia, and 0·0060 × 3,000, or 18 grm. urea respectively.

Suppose the preformed ammonia has been estimated by the Shaffer process to be ·567 grm. per litre (which is equal to 2 grm. urea), ∴ the amount of urea alone in the 3 c.c. of urine will be 16 grm. per litre. If the urine has been previously acted upon by phosphotungstic acid, which precipitates the ammonia, this deduction will not be necessary.

Note.—A method recommended by Folin, but which I have not as yet tried, might be adopted to estimate both the urea and the preformed ammonia from the one operation. This is rendered possible by the fact

that the preformed ammonia of the urine appears to distil over before the ammonia salt formed by the magnesium chloride and heat method just described, in fact, is completely distilled over in the first forty-five minutes. Moreover, the rate of distillation of the ammonia derived from the urea is constant. Now if the distillation be divided into two periods of forty-five minutes each (water being added before the second distillation to replace the same amount lost by the first distillation), it is evident that the amount of ammonia distilled over in the first distillation, minus the amount of the second, will give the preformed ammonia of the urine operated on, and this amount when subtracted from the whole ammonia distilled over will give the $NH._3$ of urea.

Uric Acid and the Urates.—The most rapid and practical volumetric method of estimating the total urates present (*i.e.*, the uric acid + the purin bodies) is that of Haycraft Deroide as modified by Denigès.

This method depends on the fact that if a mixture of magnesium and silver salts in ammoniacal solution be added to urine the urates present take up some of the silver-magnesium mixture, forming a double urate with these metals, which is precipitated. Denigès, instead of estimating the amount of silver, and hence urates, directly from this precipitate—a long and laborious process used in the method of Haycraft Deroide—estimates the amount of silver left in the filtrate after precipitation has taken place. As the strength of the silver in the silver magnesium mixture used is known, as well as proportions in which the urate and silver combine, an estimate of the amount of silver left in the filtrel after precipitation will give the amount of silver taken up by the urates, and hence the quantity of the latter present. The reason why an ammoniacal solution of silver and magnesium is used is that the ammonium present prevents the urinary chloride taking up the silver.

The amount of silver present in the urine filtrate (after removal of the precipitated urate of silver) is estimated by adding a quantity of a cyanide of potassium solution equivalent to the amount of silver originally added to the urine. When equal quantities of equivalent strengths of potassium cyanide and silver nitrate are brought together, a solution of a soluble double cyanide of silver and potassium is formed in which there is no excess either of silver or of cyanide. Owing to the removal by the urates of some of the silver solution originally added to

the urine, a cyanide solution of equivalent strength to the original solution, if now added to the filtrate, must produce an excess of cyanide in the mixture. This cyanide excess is a measure of the silver taken up by the urates in the silver urate precipitate; it can be estimated by adding a silver solution of known strength till the excess is neutralised. The saturation of the cyanide solution by the silver is easily estimated, as any excess of silver forms an insoluble precipitate of silver iodide, if a little potassium iodide be previously added to the cyanide filtrate mixture.

Procedure.—Two solutions are prepared. *Solution A* is prepared by adding together equal parts of (1) an ammonia-magnesium mixture, and (2) a decinormal solution of silver.

The magnesium mixture (1) is made by dissolving 150 grms. of chloride of ammonium and 100 grms. of chloride of magnesium in three-quarters of a litre of strong ammonia in a flask. The mixture is then corked and warmed to 25° or 30° C. (under a warm water tap) and the volume completed to the litre. The decinormal silver solution (2) is made by dissolving 17 grms. of silver nitrate in a litre of distilled water. The ammoniacal silver-magnesium solution thus formed keeps well even in white bottles. The strength of the contained silver is $\frac{N}{20}$.

Solution B is a decinormal solution of potassium cyanide and is prepared by dissolving 17 to 18 grms. of potassium cyanide in distilled water. This solution is then titrated against decinormal solution of silver, and diluted till 10 c.c. exactly neutralises 10 c.c. of silver solution, neither salt being in excess. In addition to the above solution, a 20 per cent. solution of potassium iodide is made up as an indicator to show when saturation of the cyanide solution by the silver has taken place. The least excess of silver present in this case is indicated by the formation of an insoluble white precipitate of silver iodide.

To 100 c.c. of urine add 25 c.c. of solution A (the ammoniacal magnesium-silver solution), filter off the precipitate of urate of magnesium and silver formed. Take 100 c.c. of the filtrate representing 80 c.c. of urine ($\frac{100}{125}$ of $100 = 80$), and 20 c.c. of the $\frac{N}{20}$ silver solution, and to this add 10 c.c. of solution B (potassium cyanide solution). Having added a few drops of the indicator (potassium iodide), the decinormal silver nitrate solution is dropped in from a burette, till a persistent cloudiness is obtained. Each c.c. of silver solution used represents 0·0168 gr. of urates expressed as uric acid; or to make it simpler still, multiply the c.c. of silver solution used by ·21, and the answer will represent the quantity of urates present per litre of urine.

Example.—To the 80 c.c. of filtrate obtained from the mixture of 100 c.c. of urine, add 25 c.c. of ammonia-magnesium silver mixture, 10 c.c. of cyanide solution are added. The $\frac{N}{10}$ silver nitrate solution necessary to neutralise the excess of cyanide present is 3·2 c.c.

Each c.c. of silver nitrate $\frac{N}{10}$ solution equals 0·0168 grms. of urate expressed as uric acid is 80 c.c. of urine: $\therefore$ 3·2 c.c. equal ·05376 grms. uric acid in 80 c.c., or $\cdot05376 \times \frac{1000}{80}$, or ·672 grms. in 1 litre (which is the same amount as multiplying 3·2 by ·21).

Uric Acid alone.—There are a great many methods employed for estimating the uric acid of urine, but those that are very accurate are very laborious, and others that are quicker are not very accurate. Of the longer methods that of Hopkins and its modifications are the best and simplest ; but I have found the copper process of Denigès to be both accurate and rapid. It has been adopted as the standard method in France.

In this method, and in Blarez' modification of it, the uric acid is precipitated from the urine as urate of copper, and the copper in the precipitate estimated. The combining proportion of urate of copper being known, the amount of uric acid is readily estimated when the copper in the combination has been calculated.

The phosphates present in the urine are first eliminated by the addition of a 16 per cent. solution of sodium carbonate. A colourless alkaline copper solution (made by decolourising some Fehling's solution with a little alkaline bisulphite) is now added. The uric acid of the urine is taken up by the copper, and an insoluble urate of copper precipitates out. The precipitate is collected on a filter and thoroughly washed with hot water. Collecting the precipitate by filtering is a tedious process unless suction is applied to the filter. (If a water-pump be used the filtering is very rapid and satisfactory results are obtained.) The urate of copper combination has now to be broken up and the amount of copper in the precipitate estimated, These processes may be carried out in one of two ways.

Denigès breaks up the urate of copper by putting the precipitate into a capsule and adding ½ to 1½ c.c. of hydrochloric acid, and heating. Blarez adds 10 c.c. of a 50 per cent. solution of sulphuric acid and uses a flask. Denigès estimates the amount of copper present by first adding 10 c.c. of ammonia to form a bright blue combination (copper salts in the presence of NH_3 are blue), and then decolourising this blue fluid by a decinormal solution of potassium cyanide (compounds of alkaline cyanide with copper are colourless).

It is evident from this that the amount of cyanide solution used will indicate the amount of copper present in the precipitate, and hence the uric acid.

Blarez estimates the copper in the precipitate by adding a decinormal solution of permanganate of potassium to the copper

sulphate solution until the appearance of a faint rose colour* which persists for one minute.

Solutions required for Denigès' Method.—(1) Sixteen per cent. solution of anhydrous carbonate of soda. (2) Fehling's solution, to which a solution of sodium bisulphite has been added, till the Fehling fluid is decolourised. (3) Hypobromite of soda solution, such as that used for the urea estimation. (4) A $\frac{N}{10}$ solution of cyanide of potassium similar to that prepared for the estimation of the total urates.

Procedure.—Place in a measured glass 120 c.c. of urine and 21 c.c. of solution (1); filter off the precipitate of phosphates formed. To 100 c.c. of filtrate, equal to 90 c.c. of urine, add 10 c.c. of the decolourised Fehling's solution; filter, and receive the copper urate precipitate on a small flat filter paper (an exhaust pump will be found of great use in accelerating the filtration, which is otherwise long and tedious). Thoroughly wash precipitate with hot water and then wash it off into a porcelain dish; add 1 to 1½ c.c. of pure hydrochloric acid and hypobromite solution drop by drop till the copper solution is of a yellowish tint. The total volume of washings should not exceed 40 c.c. Boil, add 10 c.c. of ammonia, which colours the solution deep blue, and when the boiling is brisk drop in the $\frac{N}{10}$ cyanide of potassium solution till the blue colour has disappeared. The number of c.c. of cyanide solution used, minus 0·01, multiplied by 11, gives the amount of uric acid in each litre of urine.

Solutions used and Procedure in Blarez' Modification.—(1) Sixteen per cent. solution of anhydrous carbonate of soda. (2) Fehling's solution, decolourised by addition of an alkaline bisulphite. (3) $\frac{N}{10}$ solution of permanganate of potassium.

Procedure.—To 37 c.c. in a measured glass add 5 c.c. of solution 1; add to the mixture, after shaking, 7 c.c. of the decolourised Fehling's solution. After five minutes filter, receiving the copper urate precipitate on a small filter paper. Thoroughly wash the precipitate two or three times. Place the precipitate and filter paper in a flask along with 150 c.c. of water, shake to free the filter paper, add 10 c.c. of a 50 per cent. solution of sulphuric acid, shake well, now add the permanganate solution till a rose-coloured tint persists for half a minute to a minute.

The number of $\frac{c.c.}{10}$th of permanganate solution employed multiplied by 2 gives the number of centigrammes of uric acid contained in a litre of urine.

The Method of Estimating the Urinary Chlorides is practically the same as that employed for the chlorides in water (Mohr's method). It is not advisable, however, to act directly on urine, owing to (1) its colour rendering the end reaction difficult to perceive, and (2) the fact that there are other bodies

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* N.B.—The permanganate solution gives off oxygen to the uric acid in the solution, and is thereby reduced and decolourised. The reappearance of the red colour of the permanganate indicates that the uric acid is oxygen saturated. The oxygen absorbing power of uric acid being known, its amount can be calculated.

beside the urinary chlorides which affect the titrating silver solution (viz., organic matters—extractives and albumens). The colour difficulty is easily got rid of by diluting the urine, while the organic matter may be destroyed by means of permanganate of potassium in the presence of an acid. An alkali (pure carbonate of lime) must be added to neutralise the urine again, as acidity vitiates the process. The principle on which Mohr's process is based is, of course, that if a chromate be added to the fluid to be analysed and a solution of silver dropped in, the latter is taken up by the chlorides present and only unites with the chromic acid to form a red chromate of silver when the chlorides are exhausted.

Procedure.—To 7·1 c.c. of urine, well diluted, add 2 c.c. of weak sulphuric acid ($\frac{N}{10}$ will do), boil gently, add permanganate of potassium till a yellow colour is present (the organic matter is now oxidised). Now add a pinch of carbonate of lime, which will not only neutralise the fluid, but will precipitate any oxalates which may have been formed by the action of the permanganate. Add a few drops of a chromate of potash solution and titrate with a decinormal solution of silver nitrate till a faint red colour is apparent. The number of $\frac{1}{10}$ c.c. of silver solution used divided by 2 gives the amount of chloride in grammes per litre of urine.

The Phosphates.—The total phosphoric acid in the urine is estimated by the nitrate of uranium method, the result being expressed in terms of P_2O_5 (anhydrous phosphoric acid). This process depends upon the fact that if a uranium salt such as the nitrate or acetate be added to urine, it combines with the phosphates present to form a phosphate of uranyl: the amount of uranium salt necessary to saturate the phosphates present is an index of the quantity of the phosphates present in the urine. Saturation of the phosphates is to be considered complete when such an indicator as cochineal or potassium ferrocyanide is attacked by the presence of free uranium nitrate.

The nitrate salt of uranium is not the best one to use for titrating, as free nitric acid is liberated during the titration of the urine. As this result can be completely checked by the addition of a little nitrate of sodium, however, it is better to use this salt than the more expensive acetate of uranium.

Procedure.—The following solutions are prepared:—

Solution A. Dissolve 40 grms. of nitrate of uranium in 600 or 700 c.c. of distilled water. As nitrate of uranium often contains free

nitric acid, this latter must be got rid of by the addition of a little ammonia (which on addition forms a precipitate) and some acetic acid (which dissolves the precipitate formed). As nitrate of uranium is never pure enough to enable a solution of required strength to be made from it directly, solution A has to be corrected by titrating it against a solution containing phosphoric acid in known strength. Such a solution may be obtained by dissolving 3·24 grms. of acid ammonium phosphate, or 5·887 grms. of soda ammonium phosphate, in a litre of water. Fifty c.c. of this solution, containing ·01 grs. of P_2O_5, are titrated along with some cochineal and acetate of soda against the uranium solution; the strength of the latter is now estimated (the most convenient strength of the uranium solution is for 1 c.c. of it to be equivalent to ·005 grms. of P_2O_5).

Solution B consists of 50 grms. each of acetate of sodium and of acetic acid dissolved in half a litre of water.

Solution C is the indicator used (tincture of cochineal).

To 50 c.c. of urine in a porcelain dish add 2 or 3 c.c. of the acetate of soda solution and a few drops of tincture of cochineal. Gently heat the dish (to about 80° C.) and pour in the uranium solution from a graduated burette till a bright green colour is apparent. As each c.c. of uranium solution equals ·005 grs. of P_2O_5, the amount of anhydrous phosphoric acid present in each litre of urine will be found by multiplying the number of c.c. by ·005 and 20; say 10 c.c. of uranium solution have been used for the 50 c.c. of urine, then $\frac{10 \times \cdot 005 \times 1000}{50}$, or 1 gr., will be the amount of P_2O_5 present per litre of urine.

The Sulphates.—The only urinary sulphur estimations which are clinically practical and of value are those of the total acid sulphates and the conjugated sulphates. While the mineral sulphates may be precipitated by a salt of barium, and estimated as barium sulphate, the phenol sulphates have first to be dissociated by the action of heat and a strong mineral acid before they will yield up their SO_3 to a barium salt. This fact permits of the amount of mineral and organic or conjugated sulphates being estimated separately.

Procedure. — Estimation of Total Sulphates. — Boil 50 c.c. of filtered urine along with 5 c.c. of pure hydrochloric acid for fifteen minutes, add 10 c.c. of a hot 10 per cent. barium chloride solution, filter through a small filter paper of known ash; wash the filtrate thoroughly till the washings give no precipitate with a silver nitrate solution; dry and calcine the filter paper and precipitate in a shallow previously weighed platinum dish. A drop or two of nitric acid aids calcination. Now cool the capsule and weigh carefully. The difference in weight between the capsule alone and the capsule + sulphate ash, multiplied by 0·34326, and again by 20, gives the amount of total sulphates in the litre of urine.

Estimation of Conjugated Sulphates.—To 125 c.c. of urine add an equal volume of a mixture of two volumes of barium hydrate and one of

barium chloride solution, both saturated. The precipitate, which consists of the mineral sulphates, is removed by filtration, and 200 c.c. of the filtrate, representing 100 c.c. of urine, boiled for fifteen minutes, along with 20 c.c. of pure hydrochloric acid. The precipitate of sulphates derived from the organic sulphates is collected, incinerated, and weighed, as in the case of the total sulphates, and similarly estimated. The difference between the total and the conjugated sulphates gives the amount of mineral sulphates present.

Carbon of Urine.—The carbon contained in a given sample of urine is estimated by breaking up the carbon compounds by means of sulphuric acid and collecting the carbonic acid gas which is evolved in a tube containing caustic potash. A carbon- and moisture-free air is then driven over the urine

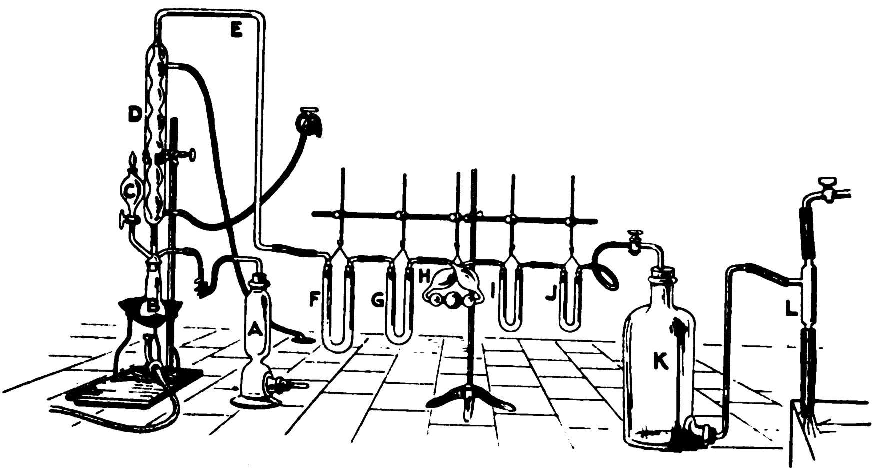

Fig. 3.

towards the potash tube to ensure the collection of all the carbonic acid. The method and apparatus used in that of Desgrez, and is as follows: 10 c.c. of urine and 10 grms. of chromic acid are placed in the 100 c.c. bulb marked B., to which are attached by means of a glass stopper three tubes; one tube leads to a stand (A) containing soda lime; a second tube leads up to a bulb (C), into which 25 c.c. of strong sulphuric acid are placed, the acid being allowed to drop slowly into the bulb containing the urine; the third tube leads up to a condenser (D), which is necessary to prevent the CO_2 gas

passing over too hot and too moist into the rectangular tube E. The first U-shaped tube (F) contains pieces of pumice stone saturated with strong sulphuric acid, in order to absorb any moisture coming over with the evolved CO_2. The second U-shaped tube (G) contains ferrocyanide of potassium and borate of soda, which absorb any chlorine or hydrochloric acid which may have been evolved from the urine. The spiral tube (H) is filled with caustic potash to absorb the CO_2 of the urine. Tube I contains pumice stone soaked with more caustic potash, and serves as a control to tube H; while the last tube (J) is filled like the first tube (F) with pumice stone saturated with sulphuric acid. This tube as well as bottle K are used to prevent any moisture getting access to the potash tubes (H and J) from the water-pump (L).

Procedure.—The potash tubes H and J are detached, weighed, and reattached. The 10 c.c. of urine and 10 grms. of chromic acid (which is necessary to retransform the sulphurous acid formed by the action of the H_2SO_4 on organic matter into sulphuric acid) are acted on by the 25 c.c. of sulphuric acid gradually introduced from the flask C. The flask B is then gently heated. The heat applied should be short of that necessary to cause boiling till towards the end of the operation; by this means the CO_2 is slowly and steadily driven off from the urine (it should be possible to count the bubbles of gas as they come off). When all gas has been driven off a current of air is passed through the apparatus for twenty minutes; this air is deprived of both carbon dioxide and moisture by passing through the soda lime (bottle A). At the end of the operation, which lasts about two hours, the potash tubes (H and J) are again weighed. The difference between the weights of the potash tubes (1) before and (2) after the operation indicate the amount of CO_2 absorbed by the caustic potash, and hence present in the urine. The amount of carbon is $\frac{3}{11}$ of this amount.

Ammonia.—Shaffer's vacuum method of estimating ammonia was illustrated and mentioned in my first paper on urinary analyses, but as the details of the process were not given they are inserted here.

This method consists in driving off the urinary ammonia by boiling urine in vacuo along with an alkali, which displaces and drives off the ammonia; the latter is collected in a decinormal solution of sulphuric acid, and the acidity lost by the acid determines the amount of ammonia present in the urine. As the urea of urine gives off ammonia if the temperature exceeds 60° C., the boiling point has to be kept below that temperature; this is effected by means of the vacuum method and methyl

alcohol. The addition of sodium chloride to the urine also helps to prevent any urea decomposition.

Procedure.—Place in the small flasks (seen suspended in fig. 4) 100 c.c. of a $\frac{N}{10}$ solution of sulphuric acid. In the large flask shown in the water-bath place 50 c.c. of urine, 50 c.c. of methyl alcohol and

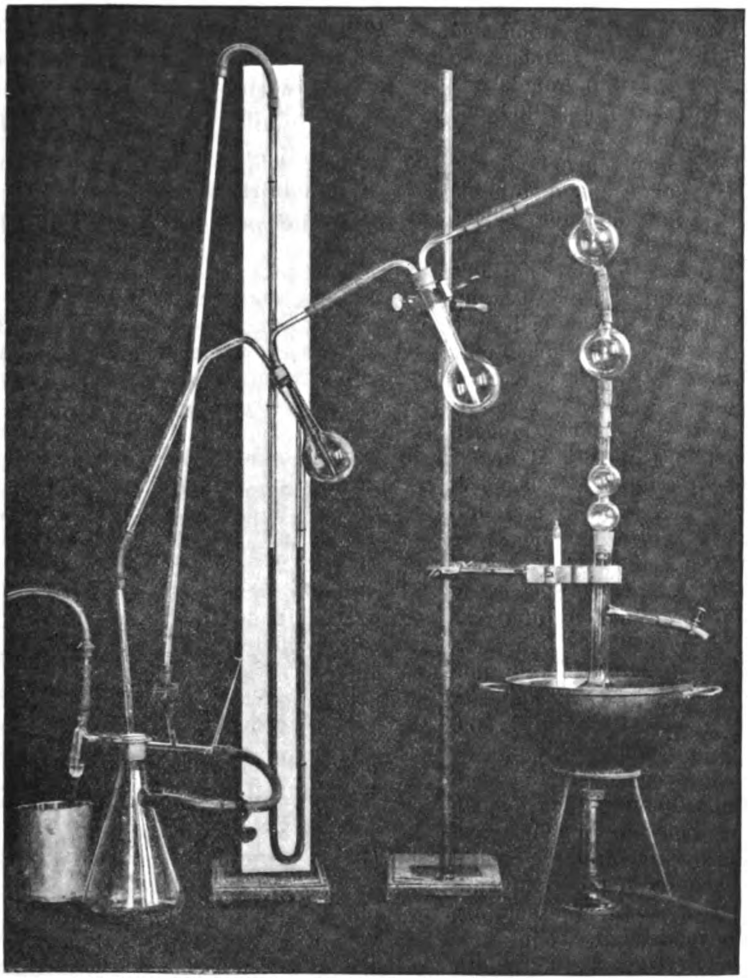

FIG 4.—SHAFFER'S AMMONIÆ APPARATUS.

20 grms. of sodium chloride; place 3 or 4 grms. of sodium carbonate in the flask and attach this rapidly to the two small glass bulbs seen just above it in the photo. The apparatus used and figured in the illus-

tration is connected to a water pump and to a mercury gauge. When the urine and other ingredients have been placed in the large flask this is placed in a water-bath, and the rubber tube seen on the right of the photo connecting the flask with the air pinched up. The air in the apparatus is now exhausted by turning on the water pump seen on the left of the photo. When the mercury gauge registers 20 m.m. of mercury the water-bath is heated. Boiling commences usually at or below 40° C. and the temperature must not be allowed to exceed 45° C. The four small glass bulbs seen in the photo above the boiling flask are simply intended to prevent any of the alkali contained in the boiling flask from being drawn into the decinormal acid solutions in the small glass flasks and so spoiling the result. After boiling for twenty minutes a current of air is allowed to pass through the apparatus, the acid-containing flasks are detached, and their acidity determined by titration with a $\frac{N}{10}$ alkaline solution. Any loss of acidity caused by the ammonia distilled over is determined; each c.c. of acidity lost represents 0·0017 grs. of NH_3.

Example.—The $\frac{N}{10}$ acid of the small flasks when titrated after the process only equals 50 c.c. of $\frac{N}{10}$ alkaline solution; therefore 100 − 50, or 50 c.c., of $\frac{N}{10}$ acidity have been neutralised by the ammonia driven off from the urine. Each c.c. of acidity lost, however, equals 0·0017 grms. NH_3; therefore, 50 c.c. equals 0·085 grms. NH_3 found in 50 c.c. of urine. ∴ the amount per litre must be $\frac{\cdot085 \times 1000}{50}$, or 1·7 grms. per litre.

Sugar.—Of the many volumetric methods of estimating the sugar in urine the best are those of Gerrard and Purdy's modication of Pavy—both modifications of the well-known Fehling process. In Fehling's original method—still largely used—the end point of the process is unsatisfactory, as it is difficult to estimate when the blue copper solution has been completely decolourised, owing to the constant formation of the red oxide of copper. Gerrard obviates this difficulty by adding a cyanide to the copper solution, which forms a colourless compound with the copper oxide reduced from the sulphate, thus giving a clear reaction. Pavy's modification is to produce a similar colourless end reaction with the aid of ammonia (which dissolves the copper oxide precipitate). Purdy has altered the composition of the Pavy-Fehling solution, substituting glycerol for the sodic tartrate employed.

Gerrard's Process.—Solutions required:—

(1) *Fehling's Solution.*—A mixture of equal parts of two solutions: (*a*) 69·25 grs. of pure copper sulphate, powdered and dried; 1 c.c. of pure sulphuric acid, and water to the litre; (*b*) 350 grms. of Rochelle salt are dissolved in 700 c.c. of water, 100 grms. of caustic potash are added, and water to the litre.

(2) A 5 per cent. solution of potassium cyanide.

Procedure.—Place 10 c.c. of freshly prepared Fehling's solution in a porcelain dish and add 40 c.c. of water, heat to boiling, add the cyanide solution carefully till the blue colour of the Fehling is all but gone (excess of cyanide must be avoided). Now add 10 c.c. of Fehling to the faintly blue mixture, and the solution is ready (a stock of this may be made up). These 10 c.c. of Fehling are decolourised by ·05 gr. of glucose. Dilute the urine to be analysed twenty times and drop it into the boiling copper solution from a burette till the blue colour has completely disappeared ; the boiling must be brisk during the whole process.

Say 20 c.c. of urine diluted twenty times decolourises 10 c.c. of Fehling's solution equal to ·05 grm. of sugar, ∴ the percentage of sugar in the urine is $\frac{20 \times 100}{20} \times \cdot 05$, or 5 per cent.

Pavy's Process modified by Purdy.—The procedure here is similar to the above, but the copper solution used is, pure copper sulphate 4·752 grms., potassium hydroxide 23·50 grs., glycerol 38 c.c., strong ammonia 350 c.c., water to the litre. 35 c.c. of this solution are equal to 0·02 gr. of glucose.

The glycerol is substituted for the unstable Rochelle salt used in Fehling's and Pavy's solutions.

Thirty-five c.c. of the above solution are boiled in a flask, and the diluted urine dropped in from a burette. As it takes 0·02 grm. of glucose to decolourise the 35 c.c., the amount of urinary sugar can readily be ascertained.

Example.—Say 20 c.c. of urine diluted ten times (*i.e.*, 2 c.c. urine) decolourises the 35 c.c. of copper solution, ∴ there will be 0·02 grm. glucose in 2 c.c., or 10 grm. in 100 c.c. = 10 per cent. sugar.

B. Oxybutyric Acid.—The most simple and rapid method of estimating this acid is by the polariscope.

B. oxybutyric acid is lævogyric, so by noting the amount of left deviation—when this is present—the amount of the acid can be ascertained. As this acid occurs chiefly in urine containing sugar, the influence of the latter substance, which is dextro-rotatory, must be allowed for. A 100 per cent. solution of B. oxybutyric acid deviates light 24° to the left, while glucose in similar strength deviates light 58·3° to the right (sodium flame). Each degree of a Laurent polariscope with sodium flame is graduated to equal 2·27 grms. of sugar, and 4·64 grms. of B. oxybutyric acid per litre of urine. With a Schmidt and Heusch's polariscope the amounts of sugar and acid per degree of the instrument are 3·34 and 6·9 grms. respectively. A sodium flame is used with Laurent's polariscope, and white light with the Schmidt and Heusch.

Procedure.—To estimate the oxybutyric acid in a diabetic urine, in say a Laurent's polariscope, the following method may be employed. To

100 c.c. of urine add 10 c.c. of a saturated solution of subacetate of lead; this removes the urinary pigments and clarifies the urine, enabling one to see through a long tube full of it. The 20 c.m. tube of the polariscope is now filled completely with the clarified urine, the tube placed in the polariscope, and the light looked at through the tube and prisms of the instrument. The amount of deviation caused by the sugar and acid together is noted. The amount of rotatory action on light rays caused by a substance is indicated by the nature of the shadow thrown on a finely bisected disc near the eye-piece of the instrument.

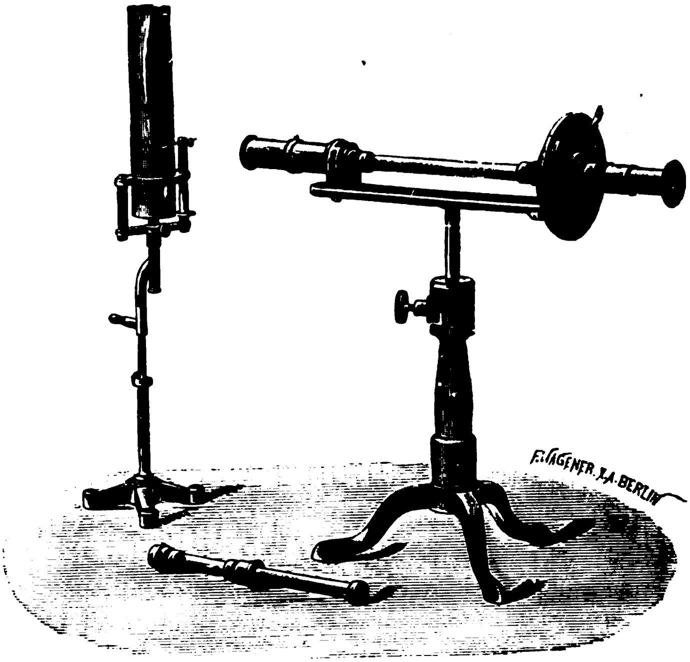

Fig. 5.—A cheap form of Polariscope well suited for estimating the sugar in urine. The 20 cm. tube is in position in the instrument. The light used here is a sodium flame.

If a tube of distilled water (which has no polarising action on light) be placed in the polariscope, the shadows on the two sides of the bisected disc are equal; if a dextrorotatory substance in solution, such as sugar, now takes the place of the water in the tube, a dark shadow varying in intensity with the amount of sugar present is seen on the right half of the bisected disc. With a levorotatory substance like B. oxybutyric acid a shadow is thrown on the left half. The amount of rotation present and hence the amount of the substance causing it is estimated by noting the number of degrees through which a quartz disc has to be moved to neutralise the polarisation, and hence restore the shades on the halves of the disc.

The amount of rotation necessary to obliterate the shadow on the right disc, caused by the diabetic urine, being noted, the amount of sugar in the urine is estimated by the cupric method. The amount of deviation caused by definite amounts of sugar being known, it will be evident that if sugar alone is present in the urine, this should be present in amount sufficient to account for the deviation of light shown by the polariscope. If the amount of polaric deviation is less than it ought to be, from the amount of sugar in it, the difference is due to the influence of B. oxybutyric acid, which is strongly lævogyric. The difference multiplied by 4·64 gives the amount of B. oxybutyric acid in grammes per litre present in the urine.

Example.—Suppose the 20 c.m. tube full of urine throws a shadow on the right half of the disc which it requires 15° of rotation to obliterate. Suppose, further, the sugar in the urine has been estimated to be 55·4 grms. per litre, as we know that each 2·27 grms. of sugar per litre of urine in a 20 c.m. tube diluted $\frac{1}{10}$ equals 1° in a Laurent instrument, ∴ there should be 20° of dextrorotation and not 15°; 20° = 15°, or 5° represents the influence of the left rotation of the B. oxybutyric acid. It takes 4·64 grms. per litre of this acid to cause 1° of left rotation in a Laurent polariscope, therefore the amount of B. oxybutyric acid present must be 5° × 4·64, or 23·2 grms. per litre.

More accurate but longer methods of estimating B. oxybutyric acid are: (1) Fermenting the urine with yeast overnight and thus getting rid of any sugar present: the polaric deviation present will be due to oxybutyric acid alone, and its amount will indicate the quantity of B. oxybutyric acid present. (2) If urine is mixed with strong sulphuric acid and the mixture strongly heated and distilled, any oxybutyric acid present is converted to crotonic acid, which is distilled over. Crotonic acid is oxybutyric acid – one molecule of H_2O, and by estimating the crotonic acid formed the amount of B. oxybutyric acid can be determined.

Albumen.—The method which has held the field up to the present for the quantitative estimation of albumen has been the ponderal one. This consists in precipitating urinary albumen by trichloracetic acid, filtering, washing the precipitate of albumen, drying and weighing. While undoubtedly an accurate method, it has no great advantages in this respect over the centrifugal method of Purdy, to be described later on, and is incomparably longer and more difficult. Latterly I have used the centrifugal method alone.

Qualitative Estimation.—Brief details of the methods employed for the qualitative examination of the urine may be of interest.

The Albumen has been estimated usually by the nitric acid test, as it yields other information besides the question of albumen. The best method to employ is to place a little urine in a conical urine glass and add the nitric acid by a pipette, the point of which is placed near the bottom of the vessel before the nitric acid is allowed to flow out; the heavier acid floats

the lighter urine up, and a very distinct line of junction is seen: A white haze to band at this junction, signifies albumen, a white ring half inch or more higher up in the urine shows excess of uric acid; a play of colours where the acid joins the urine denotes the presence of bile pigments, and a dark brown band in the same place an excess of urobilin. Boureau's reagent, a mixture of 5 parts of sulphosalicylic and 15 parts of sulphophenic acid in 100 parts of water is a useful and sensitive reagent. The most sensitive test for albumen in the urine is that by Tauret's reagent, which consists of a mixture of 4·06 grms. of perchloride of mercury, 9·66 grms. of potassium iodide, 60 c.c. of crystallised acetic acid, with distilled water to 192 c.c. The reagent gives a precipitate with the albumoses as well as albumen.

Albumoses if present in urine may be detected by first precipitating any albumen present by heat or Boureau's solution, and then adding Tauret's reagent to the filtrate, when, if albumoses are present, a white precipitate will be thrown down.

The test I have usually adopted for indican in the urine is that of Loubiou. To 2 or 3 c.c. of urine add an equal quantity of chloroform, 1 c.c. or so of peroxide of hydrogen, and 3 or 4 c.c. of hydrochloric acid; mix and heat gently. If indican is present a blue colour appears in the chloroform layer of the mixture. The intensity of the colour present shows approximately the amount of indican.

Another similar and excellent method is to substitute sulphuric acid and persulphate of sodium for the hydrochloric acid and peroxide of hydrogen; a larger quantity of urine, 20 c.c., should be taken with 5 c.c. each of chloroform and the persulphate solution, and a few drops of the acid. No heat is required. (Amman's method.)

Bile Pigments have been estimated by the Gmelin-Rosenbach test. It consists in placing a drop of nitric acid on the damp portion of the filter paper through which urine has filtered. Surrounding the spot where the acid has been placed several faintly-coloured rings will appear—yellowish-red, violet, blue and green, in that order, from within outwards.

The most sensitive method of estimating bile pigments is that of Jolles, who has gone carefully into this subject of bile pigment testing.

In a 60 cc. burette place 50 c.c. of urine, a few drops of diluted hydrochloric acid, an excess of barium chloride, and 5 c.c. of pure chloroform. Shake the above mixture well, and leave for ten minutes. Remove the chloroform and precipitate by opening stop-cock (the

chloroform and precipitate are at the bottom of the burette); the small amount of urine usually unavoidably removed at the same time does not affect results. Place chloroform and precipitate in a warm chamber or water-bath for five or ten minutes to evaporate the chloroform. Now add a few drops of nitric acid to the residue—the coloured rings above described are at once seen. This test reveals the presence of bile pigments when in 0·1 per cent. strength, while the Gmelin method unmodified does not give clear results unless 5 per cent. of bile pigments are present in the urine.

Bile Acids.—The simplest qualitative test of these acids is that of Hay. Owing to the increased superficial tension given to a fluid by the presence of bile acids, flower of sulphur, which when thrown on a dish containing normal urine floats, will sink rapidly if bile acids are present. Another test is that of Oliver, based on the fact that bile acids precipitate peptones in acid solution.

If to 20 minims of urine 60 minims or 120 drops of a mixture containing ʒss. of peptone, grains 4 of salicylic acid, ʒss. of acetic acid, and water to ℥viii. be added, a slight and temporary opalescence is produced if there is no excess of bile acids present in the urine.

This method may be used for approximate quantitative work. Appended is Olliver's table.

Urine. Minims or drops of solution added to 20 mins. of urine produce opalescence. Mins.	Drops.	Percentage of increase of bile salts over the normal. Per cent.
45	90	50
40	80	66
35	70	83
30	60	100
25	50	240
20	40	300
15	30	400
10	20	600
5	10	1,200

Centrifugal Methods of quantitative estimation. It is convenient to group all centrifugal estimations for the urinary chlorides, phosphates, sulphates, albumens and other constituents of normal or abnormal urine under this heading. To Purdy, of Philadelphia, is due the credit of having first introduced the rapid and satisfactory method of centrifugalisation into urinary work.

Instead of the long volumetric method, or the still longer and more laborious gravimetric method, Purdy essayed to measure the precipitates of chlorides, phosphates and albumen, formed by the addition of suitable reagents to the urine, and

centrifugalised to a compact homogeneous layer in a graduated centrifugal tube.

Purdy's methods are as follows: A centrifugal machine, driven by electricity and capable of a speed of from 1,500 to 10,000 revolutions per minute is employed. The arms of the machine carry tube holders, in which are contained tubes of 15 c.c. capacity, graduated to tenths of a c.c. for the first 10 of the 15 c.c.—the first 5 c.c. being finely drawn out and further graduated in fortieths of a c.c. The radius of the arms and tubes (*i.e.*, distance from the central pivot to the ends of the tubes when held out horizontally) is $6\frac{3}{4}$ inches.

To estimate the urinary chlorides, phosphates, sulphates, and albumen (if the latter is present), four of the 15 c.c. centrifugal tubes are filled to the 10 c.c. mark with urine. To No. 1 tube is further added 1 c.c. of strong nitric acid and 4 c.c. of an $8\frac{1}{2}$ per cent. solution of silver nitrate (chlorides). To No. 2, 2 c.c. of a 50 per cent. solution of acetic acid and 3 c.c. of a 5 per cent. uranium nitrate solution (phosphates). To tube 3, 5 c.c. of a mixture containing barium chloride 4 parts, strong HCl. 1 part, and distilled water 16 parts (sulphates). To tube 4, 3 c.c. of a 10 per cent. solution of potassium ferrocyanide and 2 c.c. of a 50 per cent. solution of acetic acid (albumen). The above solutions are allowed to stand for three minutes, till the respective precipitants have formed, are then centrifugalised for three minutes, and the amount of the sediment formed by the various precipitates calculated in bulk percentage to the 10 c.c. of urine employed in each case. Each tenth of a c.c. of sediment thus becomes 1 per cent. bulk percentage: each $\frac{1}{40}$ c.c. (the first 5 c.c. are divided into fortieths) equals ·25 per cent. (bulk percentage).

Tables are given by Purdy which show that with the mineral constituents (chlorides, phosphates and sulphates) revolved at 1,200 revolutions of the centrifuge per minute, each $\frac{1}{40}$ c.c. (·25 bulk percentage) of chloride precipitate equals 0·03 per cent. of sodium chloride and 0·02 per cent. of chlorine. The same amount of sulphate precipitate equals 0·06 per cent. of SO_3, while each $\frac{1}{20}$ c.c. (*i.e.*, ·5 of bulk percentage of the phosphate precipitate) equals 0·005 of anhydrous phosphoric acid (P_2O_5), except the first two $\frac{1}{20}$ c.c., which each represent 0·02 per cent. of phosphates. With the tube containing the albumen precipitate revolved at 1,500 revolutions per minute, each $\frac{1}{40}$ c.c. (*i.e.*, ·25 bulk percentage) equals 0·005 per cent. of dry albumen.

The one disadvantage of Purdy's centrifugal method is his insistence on a mechanical (preferably electrical) centrifuge. If this condition were as essential as Purdy considers it, quantitative urinary analysis would be much restricted, as electrical centrifuges are expensive and somewhat difficult to work and manage where electricity is not laid on to a building. I have, however, by experiment and calculation found a means of working out quantitative analyses on the ordinary hand centri-

fuge used largely in laboratories in England, allowing at the same time advantage to be taken of the tables Purdy has drawn up, thus permitting anyone possessing the small "high-speed medical hand centrifuge" to work out quantitative urinary analyses very simply and rapidly, and with an accurary sufficient for all clinical purposes.

The formula for centrifugal force is C. $= \frac{v.^2 \times w.}{r. \times 32 \cdot 2}$, v. standing for the velocity (feet per minute covered by the extremity of the centrifugal tube); w. for weight; r. for radius of arms of centrifuge, *i.e.*, length from pivot to tips of extended tubes. The 32·2 stands for gravity. The question to be solved, however, is not the centrifugal pressure at the apex of the tube, but the driving of the particles of the precipitate through the fluid and the conversion of the power of one variety of centrifuge to perform this into terms of another. The problem, therefore, becomes much simplified, weight and gravity can be eliminated from the equation, and the answer obtained by dividing radius of the Purdy centrifuge by that of the instrument which one is using, and multiplying the result by the revolutions used to obtain his results. Thus Purdy obtained his results and formulated his tables of the chlorides, phosphates and sulphates with a centrifuge with $6\frac{3}{4}$ in. radius, and used a speed of 1,200 revolutions per minute: all that is now necessary is to divide this number ($6\frac{3}{4}$) by the radius of our own machine and multiply the 1,200 by the result.

The standard hand machine used in this country has generally an arm radius of 5 to 6 inches, and a spin of 20 to 60 revolutions to each turn of the handle. The machine I worked with had an arm radius of $5\frac{1}{4}$ inches, and a spin of 20 to each turn of the handle. Here $\frac{6\frac{3}{4}}{5\frac{1}{4}} \times 1{,}200$ (the revolutions Purdy employed in his chloride, phosphate and sulphate estimations), or 1,560 revolutions, were necessary in order to obtain similar centifugal force to that which he uses. Purdy employs his centrifugal force for three minutes to obtain his results, so by turning the handle of my machine $\frac{1560}{20}$, or 78 times a minute, for three minutes, I was enabled to make use of his tables. If a watch be placed on the table and 13 revolutions be made in every ten seconds, it will be found quite easy to keep up a regular speed and get constant results. This regulation of speed is not so easy if one tries to count the 78 revolutions in the whole period of sixty seconds.

A similar calculation to the above in the albumen estimation tables (when a speed of 1,500 on the Purdy machine has been used) would necessitate a speed of 1,970 revolutions, or 16 turns of the handle in ten seconds. As the tubes supplied with the hand centrifuge are generally 10 cc. tubes (graduated to $\frac{1}{10}$ of a c.c., except the two first c.c., which are graduated to twentieths), two-thirds of both the urine and the ingredients used by Purdy must be taken and the results obtained multiplied by $\frac{3}{2}$. It is better, however, to obtain the well-graduated 15 c.c. tubes used by Purdy.

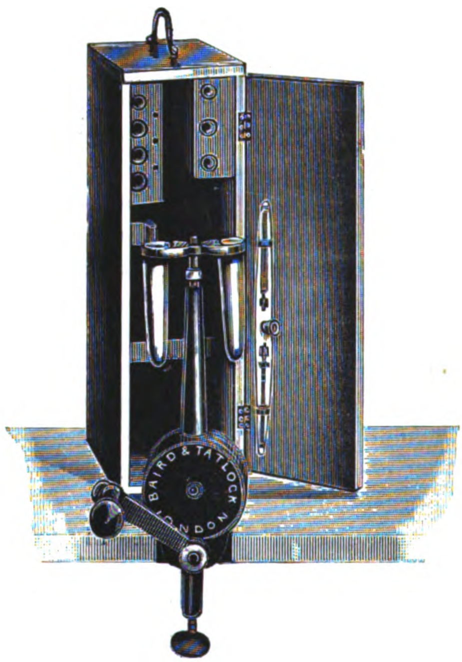

Fig. 6.—The high-speed hand centrifuge in general use in laboratories.

I have endeavoured to further extend the use of the centrifugal method by working out methods for estimating the urinary uric acid, total purins, purins apart from uric acid and the conjugated sulphates. The results so far obtained have been very encouraging, but the amount of labour required to work out the necessary tables and check the results is con-

siderable, and I have been unfortunately obliged to abandon the work—I hope temporarily—before its completion. I may say that the method devised for estimating the total purins is based on the Haycraft-Denigès' procedure described earlier in the paper. Instead, however, of combining the two parts 1 and 2 of solution A, described on page 326, I first add the ammonia-magnesia mixture to precipitate out the phosphates, and then add the $\frac{N}{10}$ silver solution. The resulting precipitate of silver and purins is centrifugalised, and its amount calculated and checked by control experiments with the Haycraft-Denigès' method.

The uric acid (alone) is calculated on a method allied to the Denigès' procedure for calculating this body: the phosphates are eliminated by solution 1 containing carbonate of soda (page 327), and uric acid precipitated out from the filtrate by the addition of a given quantity of Fehling's solution acted on by an alkaline bisulphate. Uric acid is alone precipitated out under these conditions, and can be centrifugalised out as a urate of copper.

The total sulphates are estimated by treating the urine with strong hydrochloric acid in the presence of barium chloride and boiling for ten minutes, the resulting precipitate representing the total sulphates being centrifugalised and measured. Purdy does not use heat when estimating the total sulphates by the centrifugal method, and cannot, as far as I am aware, completely precipitate out his conjugated sulphates.

The conjugated sulphates are estimated in a similar manner to the total sulphates in the filtrate of a urine to which the chloride of barium and a little acetic acid have been added to precipitate out the mineral sulphates.

The above methods of estimating the total and conjugated sulphates appear—so far as I have gone—to give results sufficiently accurate for relative determination of the salts. The method is certainly a rapid and simple one.

Conclusions.—If accurate centrifugal methods can be devised, as now seems probable, for estimating most of the urinary constituents, quantitative urinary analysis will become so simple a matter as to be undertaken in all hospitals of any size where a hand centrifuge exists and a few chemicals are procurable.

While quantitative urine work is confined to a few meta-

bolism experiments in selected laboratories we shall continue to lose the great opportunities which we all have of finding out something of the conditions of metabolic exchange and body nutrition in various diseases; of organic resistance to disease, and the effect of diseases on the nutritional rhythm. The microbe has had considerably more attention paid to it than has the chemical nature and cell life of its occasional medium of growth—the human body.

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Clinical Notes.

CASES OF BILHARZIA HÆMATOBIA.

By Capt. R. C. LEWIS, R.A.M.C.

These cases occurred amongst the men of three drafts which joined the 2nd Batt. Argyle and Sutherland Highlanders, at present stationed at Fort William, Calcutta, from South Africa during the year 1902.

In the first draft which landed in India in May, 1902, and consisted of 150 N.C.O.'s and men, 29 men had eventually to be invalided, that is, 19·33 per cent. were suffering from bilharzia. The second draft arrived in October, 1902, and consisted of 90 N.C.O.'s and men; of these, 7 men were invalided, that is, 7·44 per cent. The third draft arrived in December, 1902, and consisted of 160 N.C.O.'s and men; of these only 4 men were invalided, that is, 2·5 per cent.

These men took part in the operations in the Western Transvaal and garrisoned Rustenburgh for six months. The majority stated that they felt little inconvenience from the disease while in South Africa.

Of those in whom active symptoms were present, all suffered at different times from hæmaturia and irritability of the bladder. In a few of the cases the disease did not manifest itself until arrival in India, and the sufferings of the former were stated to have been much increased since landing, due no doubt to the enervating climate and concentrated condition of the urine brought about by increased excretion from the skin. In none of the cases was stricture or fistula present, and in only a few of the patients was debility marked; in one case the rectum was involved, and was of interest, as it was taken to be one of malignant disease. The growth involved the rectum for two-thirds of its circumference and extended for about 3 inches above the internal sphincter. On examination a hard growth, breaking down in the centre, could be made out. The case had been prepared for operation, but as I had only seen and examined the patient for the first time, and the operation was a serious one, I directed that a piece of the growth be removed and examined microscopically, which was done, and the section showed the stroma of the growth to be full of bilharzia ova. This case had no previous symptoms except those confined to the rectum. None of the ova had the spine placed laterally as described by Manson in his book on "Tropical Diseases."

There is little doubt but that the great majority of these cases contracted the disease during the six months they were stationed at

Rustenburgh, in the Western Transvaal, where the disease is endemic, as all those men that I have questioned on the subject declared that they never heard any of the men complaining of hæmaturia previous to this, but that afterwards it was quite common. On interrogation of the men at present in hospital, I was informed that the drinking water was drawn from a well quite close to the gaol at Rustenburgh, the water being raised by means of a hand-pump; that the only protection was a wooden cover, no wall being raised round the margin; that the water was not boiled or filtered, and that it was condemned after some time as unfit for drinking purposes. There was also a small river close by in which the men washed and bathed.

The parasite probably gained admission in these cases through the medium of the drinking water, or perhaps by the men accidentally swallowing some of the dirty river water while bathing.

The conditions for its spread amongst the native population in this district of India are most suitable. The habits of the native, once it got a foothold, would conduce to its rapid diffusion, and the presence of the numerous tanks, swarming as they are with different species of aquatic arthropoda, would be most suitable for its development, hence the greatest care has been taken to burn the fæces and urine of all those cases diagnosed here, and sufferers from this disease should be kept under careful surveillance, at any rate in this country, where the conditions for its spread are so much more favourable than in England.

The treatment of the foregoing cases with drugs had apparently no effect on the life of the parasite, and beyond relieving the bladder irritability by the usual treatment, and attention to the general health, the numerous drugs tried were of no avail.

Judging from the above cases, there must be a large number amongst the men who composed the South African Army who returned home suffering from bilharzia, and it is a matter of great moment as to the possibility of its spread, especially in the rural districts, by these men who have left the Service and returned to civil employment.

CASE OF BILHARZIA HÆMATOBIA IN A SOLDIER WHO HAD ONLY SERVED IN ENGLAND AND INDIA.

By Capt. E. P. SEWELL, R.A.M.C.

No. 5785 Pte. J. Jeremiah, 1st Batt. South Wales Borderers, was admitted to the Station Hospital, Mian Mir, on September 19, 1903, suffering from fever. He stated that on August 17, 1903, he had first noticed he was passing dark-coloured urine. This still continued, and on examination was found to contain much blood and albumen. Micro-

scopically the urine showed blood cells, casts, bladder cells, and numerous ova of *Bilharzia hæmatobia*. This is a very interesting case, as the patient, according to his own statement, had never served in any country except England and India. In both countries this disease has not occurred except as imported cases. Lately many men have been found suffering from it in India who had served in South Africa during the war. If this parasite has found a suitable host in India there is great danger of this serious disease becoming endemic.

TWO CASES OF OVARIOTOMY AT THE LOUISE MARGARET HOSPITAL, ALDERSHOT.

By Lieut.-Col. W. WATSON PIKE, D.S.O., R.A.M.C.

Case 1.—Mrs. Q. was admitted in February, 1903, with slight ascites and a small tumour in each ovarian region. She had twins on two previous occasions, once at the fourth month and once at full term. She suffered from very little discomfort, and though strongly recommended, would not agree to an operation. After a month's rest she was somewhat relieved and left hospital. In June last she was admitted in a state of collapse—she could not lie down on account of the fluid in abdominal cavity causing dyspnœa. I at once removed 280 ounces, and two days after 320 ounces more; this gave immediate relief. The tumours now were seen to be multiple on both sides. Owing to her weakness operation was then contraindicated; she took nourishment well and her general health improved. The fluid returned rapidly.

I pointed out to the patient and her friends that without operation there could only be one termination of the disease, and with operation there would be a chance, though a very slight one, of life. They then agreed and expressed regret at not having done so in February, when she was in first.

Two days prior to the operation I tapped the abdominal cavity and removed 400 ounces of clear fluid. On July 28 gas and ether was administered, and I opened the abdomen in the mesial line below umbilicus. The growths on the left side were found to be closely adherent to the adjacent parts, but more particularly to the sigmoid flexure and rectum. The largest cyst was tapped, and with as many others as possible removed, but portions of cyst wall had to be left where the adhesions were too firm for separation. About fifteen cysts were removed varying from the size of a walnut to an orange.

Five cysts were removed *en masse* from the right side, and as the patient was becoming weak I had to operate rapidly. The abdominal

cavity was washed out with boiled water, temperature 110°, which, acting as a stimulant, temporarily relieved shock. The incision was closed and a glass drainage tube placed in lower angle leading into Douglas' pouch. Patient was placed in bed with hot bottles, &c.; shock was very severe. An enema of brandy 1 oz., hot water 2 oz., was given, and later on an enemata of Valentine's Beef Juice, with hypodermic injections of strychnine, and also ether. However, she gradually sank and died fifteen and a half hours after operation.

A limited *post-mortem* examination was made, which showed all ligatures were intact and there had been very little oozing. Sections were made from the fibro-cystic tumours removed, which showed no signs of any malignant tendency, though the naked-eye appearances of those on the left side gave me that idea.

Case 2.—Mrs. B. was admitted on August 17, 1903, with large ovarian swelling. She had had four children, the last a year ago. She noticed the swelling about three months ago and stated it first appeared on the right side, but a few days before admission something gave way and it rose "suddenly up to the navel." She had great pain and was sent in from Pirbright in a cab.

On September 7, when her general health was improved, I opened the abdomen in mesial line below umbilicus and found a fibro-cystic tumour of left ovarian region, 12 in. by 15 in.; the pedicle was tightly twisted, and the tumour, which was of a livid red colour, had formed adhesions to the surrounding parts, most of them recent, and all readily gave way except that of the transverse colon, which was very dense. There was a good deal of oozing. The abdomen was washed out with boiled water, 200 parts to 1 of carbolic acid, at a temperature of 110°, till the solution returned clear; most of this was then pressed out. I closed the wound with two rows of interrupted silk sutures, first peritoneum and then the walls, and placed a glass drainage tube in Douglas' pouch. Boric acid and carbolic lotion was then rubbed into the skin of the abdomen, and gauze dressings applied and kept in position by an eight-tailed bandage. I removed the fluid from the tube every two hours for the first twenty-four, after which it was dry and I removed it. The temperature, which had ranged from 99° to 103° before operation, dropped to normal on the second day, and remained so throughout convalescence. I removed the sutures on the seventh day, when the wound was completely healed, and the patient made an uninterrupted and satisfactory recovery.

Remarks.—I think these cases point to the very great danger of delay in operation when once a tumour is detected in this region of the abdomen (ovarian). Delay not only allows the general health to become imparied, but favours the strengthening and occurrence of adhesions which are the recognised "bugbear" of abdominal operations.

The chances of recovery were rendered practically *nil* in the first case when operation was refused when first under treatment.

NOTES OF A CASE OF CEREBRAL EMBOLISM DUE TO MALARIA.

By Major J. B. WILSON, R.A.M.C.

Pte. A. S., 1st Hampshire Regiment, was admitted to the Station Hospital, Lucknow, on October 6, 1902, for ague. His health previous to that time had been good. He was brought before an Invaliding Board on January 26, 1903, at Lucknow, and was sent home to England in the "Sardinia," on April 10, 1903. Altogether he spent 169 days in Hospital at Lucknow. During this time he is stated to have had a rise of temperature almost every evening.

He arrived at the Royal Herbert Hospital, Woolwich, on May 5, 1903. There is a note on his invaliding documents to the effect that he improved on the voyage. On arrival at the Herbert Hospital, although he was very anæmic, he did not show any graver symptoms than the other invalids from tropical malarial disease.

After a day or two, however, he got an attack of fever, evidently of a serious nature, and on May 10, 1903, was handed over to my care. His condition at 10 a.m. on that date, when I first saw him, was as follows: temperature 100·8°, pulse 80, respiration 26. The patient was lying in bed in a semi-conscious condition. The peculiar earthy pallor of malarial cachexia was well marked. The pupils were dilated, but equal. The patient could be roused, and could evidently understand what was said to him, but soon relapsed into a vacant, semi-conscious condition. When roused, and when he tried to reply to questions, he was found to be partially aphasic, but not aphonic. He made sounds and used words which had obviously no relation to what he wished to say. There was marked deflection of the tongue to the right on protrusion. There was spastic irritation of certain groups of muscles in the right shoulder and arm. In the forearm the extensors were affected in this way. The hand would not shut easily, and when it was closed it opened again and the fingers came to the position of hyper-extension

At this time there was no paralysis, except partially, that of speech. Later, paralysis of the muscles on the right side of the face came on and gave rise to the characteristic puffing out of the cheek on expiration on that side. The tongue was coated with yellow fur, the breath very offensive. The bowels were constipated. The liver on percussion was not enlarged. There was, however, a slight increase in the area of splenic dulness, showing enlargement of that organ. Careful examination revealed nothing abnormal in the heart and lungs, and there was no albumen

in the urine. There was no appearance or history of injury to the head, or of ear disease.

Cerebral embolism of malarial origin was diagnosed. Treatment, 5 grains of calomel given at once, and the administration of quinine was continued at first by the mouth in 10-grain doses, but later hypodermically. He rallied somewhat on that evening and spoke quite rationally and distinctly. An examination of blood from the finger, taken with the usual antiseptic precautions, gave negative results as regards the presence of parasites. In the red corpuscles, however, and in the liquor sanguinis, an enormous number of black pigment granules were found. Those in the red corpuscles were arranged in an irregular dotted line round the periphery of the corpuscle.

The improvement manifested on May 10 was not maintained. On the 11th and 12th his symptoms passed into those of "cerebral irritation," viz., slight photophobia and a general disposition to shrink away from the observer and curl up in the bed-clothes, all the limbs being maintained in a state of semiflexion. This state alternated with one of restlessness, picking at the bed-clothes, wandering delirium, and spasmodic jerkings of various groups of muscles. During the periods of restlessness he required an orderly constantly by the bedside to control the movements and keep him from getting out of bed. Quinine hydrobromide continued to be administered hypodermically in 3-grain doses twice daily, and a 5-grain dose of calomel was again given.

Another examination of the blood was made on the 12th. Several slides were carefully gone over, but no parasite could be detected, and there was no leucocytosis. Pigment granules were again found in great numbers, both in the liquor sanguinis and in the corpuscles, as described above.

There is but little more to add. The patient grew steadily worse in spite of treatment. He subsided into a comatose condition, and died on May 13, 1903, at 1.15 p.m.

The relatives of the patient at first did not wish to allow a *post-mortem* examination, but eventually they consented to a modified one, which had to be rather hurriedly performed. The liver was not weighed but appeared normal. The spleen appeared absolutely normal and only weighed 9½ ounces. The brain was removed for examination with its membranes. The membranes were congested and some reddish fluid was found in the arachnoid cavity, but otherwise there was nothing abnormal in the macroscopic appearances of the cranial contents.

A microscopic examination of sections of the brain, liver, and spleen was undertaken by Capt. C. B. Lawson, R.A.M.C., who submitted the following report.

PATHOLOGICAL REPORT.

Sections of liver, spleen and brain were examined microscopically.

(1) Liver. Black pigment was found in the blood-vessels and yellow pigment in the cells of the parenchyma.

(2) Spleen contained melanin in the cells of the parenchyma as well as in the blood-vessels.

(3) Brain. The cortical grey matter, especially the part forming the fissure of Rolando on the left side, contained black pigment in the vessels, and in addition yellow pigment in the parenchyma. This, I think, is the "pigment ochre" of Kelsch and Keiner, which is of great pathological importance owing to the fact of it being an irritant poison, while the ordinary black pigment (melanin) so pathognomonic (while intravascular) of malaria is not the least so. The presence of this yellow pigment in the grey matter of the cortex, would explain most, if not all, the nervous symptoms of the case.

NOTE.—So far as I am aware, cases of this kind are extremely rare. Manson in his book on "Tropical Diseases" classifies the cerebral forms of malaria as hyperpyrexial and comatose. He also mentions embolism of cerebral capillaries, but attributes it to actual plugging by the malarial parasite. I have seen at least two well-marked examples of the hyperpyrexial form, but none of the other forms.

In this case the symptoms seem to have been due to the poisonous nature of the yellow pigment deposited in and around the capillaries of the cerebral cortex.

The lesion evidently originated in the third left frontal convolution, giving rise to aphasia and, first, to irritation, subsequently to paralysis of the groups of muscles controlled by the nerve centres in that neighbourhood. Subsequently the whole cortical area appears to have become more or less affected, giving rise to the symptoms noted of general intense cerebral irritation, coma and death.

Editorial.

BLACKWATER FEVER.

THE recently published reports to the Malaria Committee of the Royal Society contain some interesting papers on the researches carried out by Messrs. Daniels, Christophers and Stephens on this disease. Thanks to the liberality of the Royal Society, we have been enabled to send these papers to all our stations where malaria occurs. We have been, of course, unable to supply copies to the Indian stations, as they do not come under our jurisdiction, but it is to be hoped that the Indian Government will do so.

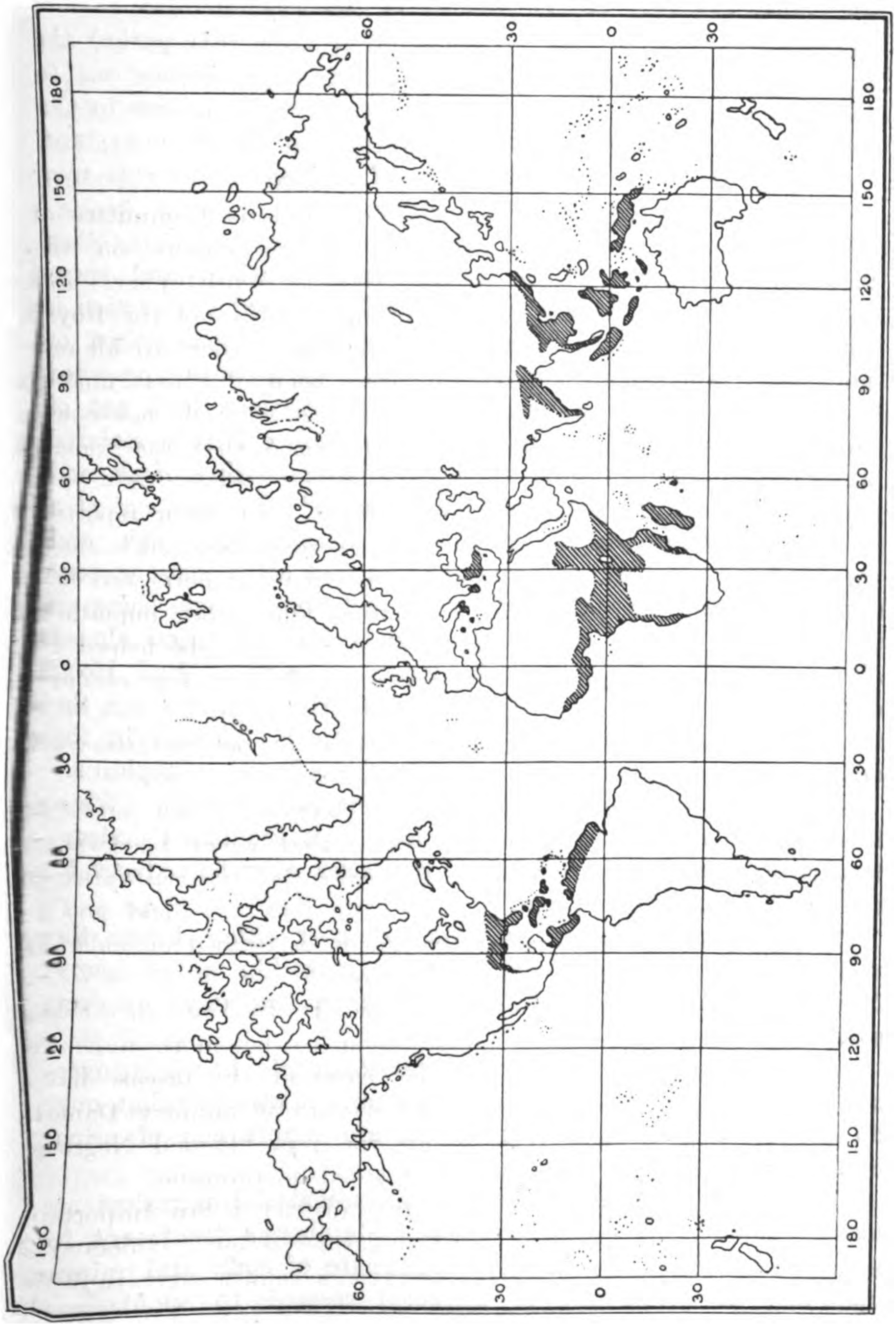
Now as cases of hæmoglobinuric fever have been reported from India, and as some of our readers may have such cases under their care, it may be useful, as these Reports are not easily accessible, to recapitulate some of the more important points, in order that officers of the R.A.M.C. may be helped to a further investigation of this interesting and at present obscure disease.

The Editor will be glad to receive any communication or report of work on the subject.

Geographical Distribution.—This is roughly shown on the accompanying map. It will be noticed that where blackwater fever occurs malaria, and usually the so-called tropical variety, is also endemic, although the converse does not hold good; the Roman Campagna, for instance, being a hotbed of malaria, although hæmoglobinuric fever is unknown.

Susceptible People.—The white race is by far the most susceptible. Indians and Chinese seem to be more resistant than the white man, but numerous cases of the disease have been reported among them. After very careful enquiry, Daniels could not find a single case among the pure-blooded Negroes, and concludes that they may be regarded as immune.

Length of Residence in an infective district is an important factor as regards liability to the disease. Daniels collected a large series of cases, and constructed a chart showing the incidence according to the length of residence in the district.



He points out that recent arrivals in the districts are seldom affected during their first six months, but after this period the liability to infection increases with length of residence up to the end of the third year. Then follows a rapid decline in the susceptibility, few being attacked during the fourth year, and practically none after the fifth year of residence. In this way the disease somewhat resembles malaria.

Nature of the Disease.—Daniels defines the disease as "an acute hæmolysis of sudden onset, short duration, and spontaneous cessation." One of the products of blood destruction is discharged in quantities with the urine as free hæmoglobin, or more rarely as methæmoglobin. The onset is generally preceded by a prodromal period, during which the patient feels out of sorts, much as if about to suffer from an ordinary malarial attack. The actual disease frequently begins with a rigor, and the passage of a quantity of "black water." Pyrexia, not of a definitely malarial type, is usually present; hiccough and vomiting are common symptoms, and in bad cases may be very severe. At an early stage the skin and conjunctivæ show an icteric tinge, closely resembling jaundice. The urine almost always contains hæmoglobin in large quantities. Red blood corpuscles are not present in uncomplicated cases, nor can the reaction for bile be obtained. Albumen is present in the earlier stages, but not later, or unless there be some nephritis.

The hæmoglobinuria may last from one to four days. When it continues more than two and a half days the blood destruction is enormous; the red blood corpuscles may be reduced to nearly one million per c.mm.

Relapses are common, and usually occur either before the urine is quite free from hæmoglobin, or within a few hours. More rarely they may take place after a few days or even some weeks.

Mortality.—Daniels thinks that the death-rate has been overstated; from his own observations he puts it at somewhat over 20 per cent. The three main causes are suppression of urine, cardiac failure, and hyperpyrexia.

Treatment.—Daniels thinks that unless malarial parasites are found quinine should not be given. Sternberg's treatment for yellow fever (frequent doses of bicarbonate of soda and minute quantities of perchloride of mercury) seemed to yield good results, or at least was not harmful.

Etiology.—It is generally accepted that there is some connection between malaria and blackwater fever, but what the exact relationship may be has not yet been determined. Daniels notes that in British Central Africa, and in West Africa, similar Anopheles are found, and these are not found in other countries. He suggests that possibly the different hosts may in some way modify the parasite. In any case it would be of great interest to know more about the distribution of the different species of Anopheles. Malarial parasites are generally present if looked for early enough.

Relation to Quinine. — In 1874 Tomaselli attributed the occurrence of blackwater to the toxic action of quinine. Koch, as the result of his work in German East Africa, supported this view, while Christophers and Stephens say that in the majority of cases quinine is the proximate cause.

Daniels, on the other hand, points out that cases occur in which no quinine has been taken, that there is no relation between the time at which the quinine is taken and the onset of the disease, nor between the quantity taken and the severity and duration of the attack. Again, it is well known that in bad malarial districts, which all blackwater ones are, practically everyone is in the habit of taking quinine regularly and certainly when feeling in any way ill, so that it is the exception to find any case of fever, blackwater or otherwise, in which quinine has not been taken shortly before the onset of the illness. Christophers and Stephens made some very interesting observations on the tonicity of blood in blackwater and malaria. Their results showed that the blood in blackwater fever has a low tonicity, *i.e.*, is resistant to hæmolysis, which they think may be explained by assuming that all the high tonicity corpuscles have already been destroyed. In malarial subjects there is usually a high tonicity. The blood of convalescents from blackwater resembles that of convalescents from malaria. The natives' blood frequently showed a remarkably low tonicity. Hæmoglobinuric urine and serum from a hæmoglobinuric patient had no hæmolytic action on the observer's blood. In vitro no difference could be detected between the patient's and the investigator's bloods as regard the solvent action of solutions of quinine. They suggest the possibility of the lethal action of quinine on the parasites setting free a large quantity

of toxins and so causing the blackwater. Hæmoglobinæmia was only observed in one case.

Special Parasite.—Up to the present no one has found any parasite special to this disease.

From the above very inadequate notes it is evident that the last word has not been said regarding this disease. The questions we would ask our officers serving in blackwater districts are :—

(1) Are the cases which occur in India true blackwater fever, and how are they to be distinguished from cases of hæmoglobinuria, which occur in all countries irrespective of malaria? For example, transfusion of blood from one animal to another will produce hæmoglobinuria. It is said to be common after extensive burns, and as a result of heat-stroke. It has been described as a complication in enteric and scarlet fevers. Paroxysmal hæmoglobinuria is often caused by exposure to cold. and cases are sometimes found in our London Hospitals who can bring on an attack at will by merely taking a walk outside the hospital in cold weather. Lastly, many drugs and poisons will produce it, as, for example, chlorate of potash, pyrogallic acid, hydrochloric and sulphuric acids, naphthol, and carbolic acid. One curious thing is that paroxysmal hæmoglobinuria is not a serious disease, and does not appear to do any damage, whereas blackwater fever is looked upon by everybody as very dangerous and often fatal.

(2) If the cases in India are true blackwater fever, then, are they merely cases of malaria in which the blood corpuscles have been damaged to such an extent that they readily give up their hæmoglobin, or is the destruction of the corpuscles caused by some specific parasite, or some hitherto undescribed species of the malarial parasite?

(3) What is the effect of injecting blood from these cases into monkeys, dogs, rabbits, &c.?

(4) Are there any parasites other than malaria to be found by splenic puncture during life?

The following books may be consulted: "Royal Society Reports to Malarial Committee," by Daniels, Christophers and Stephens; "Diseases of Warm Countries," by Scheube; "Twentieth Century Practice of Medicine: Malaria," by Marchiafava and Bignami; "A Practical Study of Malaria," by Christophers

and Stephens, published by Longmans, Green and Co., 10s.; "Laboratory Methods," by Daniels, published by Bale, Sons and Danielsson, 15s.

Christophers and Stephens and Daniels in their recent books give an outline of the procedure to be followed when investigating a case of blackwater fever.

Echoes from the Past.

LETTERS FROM (THE LATE) SIR THOMAS LONGMORE FROM THE CAMP BEFORE SEBASTOPOL, 1855.

Light Division,
Camp above Sebastopol,
February 16, 1855.

My dear Birkett,—I have been intending mail after mail to reply to your letter which I received, I am ashamed to say, six or seven weeks ago. I was very glad indeed to hear from you, and I thought it very kind on your part to think of writing.

I am sorry to say that the deficiencies, which you supposed existed and which the newspapers have described, in the medical arrangements and affairs of the Army have not been exaggerated. Shortly after the battle of the Alma I wrote home a very strong letter, which an uncle of mine published in the *Daily News* of November 8, 1854. I wrote at some length; it occupied nearly three columns of the newspaper. I regret I did not ask my brother to show you the letter. But it was not only after Alma, it was long before, in Bulgaria, that I and others saw what must happen, badly appointed as we were in respect to transport and hospital equipment, and subject so completely to the caprice of the military authorities under whom we were acting. We did not know it would be so bad as it has been in the Crimea, because we did not know that we were to be deprived of all our ordinary hospital armament, limited as that was, on landing and taking the field. All my hospital boxes, &c., were left behind either at Varna, or in the transport which carried us to Kalamita Bay. I brought two small panniers, on a vicious brute of a pony which I could not get exchanged, and which was always the cause of trouble to me, and those contained all the surgical and medical stores I had for my regiment, excepting a few stretchers carried by the bandsmen. I have reported everything to the Commission sent out by the Duke of Newcastle. You must know that I am one of the troublesome medical officers of the Army. I and

Watt, of the 23rd, run in couples. From the time we were at Devna to the present time, we have been constantly writing official letters, complaining, remonstrating, warning, and in short, as the military people call it, "making difficulties" of every sort. We have equally written through our Colonel to the General Officers, and through the Staff-Surgeons to the Head of our own department. We could not have done so had we not been supported by the head "medicine man" of our division, Dr. Alexander, whose name has been often mentioned in the papers. I believe he has been the only independent man in his position—stating plainly and bluntly that the Regimental Surgeons have been without the necessary accommodation and medicines for the treatment of the sick. At Monastere I wrote such a letter about being without medical comforts for the hospital when it was full of cholera, and diarrhœa was prevailing—backed by my Colonel—that a general hubbub was created; my complaint, however, was proved to be "frivolous" by General Airey (now Quarter-master-General) and shortly afterwards a friend who had been dining with Lord Raglan told me that he had mentioned to him something about there being "a screw loose" in the Medical Department of the 19th Regiment. I fear my prospects of promotion are done for, but that affects me very little, as I would rather remain a regimental surgeon than take promotion in the present system of medical affairs. Dr. Hall, appears to me to be a theorist, all his faith seems pinned upon returns—I have seen no evidence of his being a practical man. I cannot understand how he condescends to retain his office after the wigging he got from the Commander-in-Chief in General Orders. I am quite certain that had he *insisted* on our having in the field the necessary ambulances, &c., Lord R. dared not have faced public opinion and refused the demand; if he did, Dr. H. should immediately have left the position he must have well known he could not keep, under such circumstances, with credit to himself or the Department, or benefit to the sick and wounded. I am equally certain that had Dr. Hall exhibited the necessary method, energy and firmness, we should never have been without our proper supply of medicines and medicaments in the Crimea—for you must recollect that along the march we were in communication with our ships and transports, and ever since

the ports of Balaklava and Kamiesch have been opened we have been in constant communication with Constantinople and the depôts of stores at Scutari. Even so late as the beginning of the present month we could get hardly any medicines. To an urgent complaint on this head made by Watt, Dr. Hall wrote through the surgeon of the division, Dr. Alexander, that perhaps Dr. Watt had better try the use of charcoal, there was plenty of that. I must send you a copy of Watt's reply—it is rather satirical. But imagine when our hospitals were full of frost bites, scorbutic dysentery and general emaciation, and cachexia from overwork, want of food and clothing, and all kinds of exposure—fancy his coolly sending to a regimental surgeon to "try charcoal." We are getting rather better now, for we have better allowance of rations, some vegetables occasionally and a greater proportion, though still scanty, of fresh meat. The French, by taking the right, have diminished the labours of our men, who had dwindled down to a number totally inadequate to the work. Some few huts have been erected, also, and on the whole things are "looking up" as they say in the markets. But *nos numerus sumus*—we are now a mere handful. Out of my own poor remnant of a regiment I have already this month sent 100 invalids away, and I have this day sixty-four sick in the field hospital, chiefly scorbutic affections. We have less of the fearful mental and bodily prostration than we had during January—such cases of utter degradation of the *visvitæ* as we had during that month I trust I may never witness again—I never read or heard, much less witnessed, anything approaching to it.

Gen. Sir. G. Brown has joined us again—to my regret—for though a bulldog in courage, he refers everything to the Peninsula standard, and wants all the qualities I consider most essential to a good general officer. He always stood in the way of every sanitary improvement in Bulgaria. I cannot give you a better illustration of his character than the following anecdote: —He was wounded in the arm on November 5, and has since been away from camp, either on board ship or at Malta. He saw the regiment three days ago, and about the first question he asked our commanding officer was whether he had pipe-clay? The major in command replied that he had not, and on further enquiry, that there was none to be got at Balaklava.

"Well," said Sir George, "it must be got from England, get your belts clean, then the men will think of cleaning themselves." Not a word about the *means of ablution* and *personal cleanliness*—one of our greatest difficulties. Our only water is got from very small streams issuing out of springs in the ravines. The men bring with great labour enough for cooking up to camp. From only one set of flannels having been issued to the men until lately, when a second set was given, from their constant labour, utter fatigue and prostration, and always lying on the muddy ground, their underclothing became infested with a species of vermin, different in some respects from the ordinary pediculus; they multiplied in immense numbers, and the more anæmiated and prostrate the man, the greater the increase of the parasites. We have done all we could to arrest the evil, but without washing tubs, bathing place, drying place, with snow on the ground, and no protection but a tent, it has been impossible to prevent it altogether. Men threw away their flannels, abandoning all hope of ridding them of their swarms. You would not credit it, if I were to describe what living tissues I have seen some of these woollens become. Very few officers were at one time, before we got our baggage from the transports, free from some of these companions; and even at this moment no means are arranged for washing even our hospital blankets. I long since suggested the conversion of two houses or sheds at Balaklava—one into an ablution, the other into a drying house, for hospital blankets, &c.—but nothing was done. One of our great difficulties is still to obtain for the men the time and means of personal cleanliness; Sir George Brown proposes to effect this object by pipeclaying the belts and *appearing clean*—perhaps the reality of cleanliness may follow.

Remember me to Mr. Cock-Callaway and my other friends at Guy's. Watt also desires to be very kindly remembered.

Very truly yours,

(Sd.) THOS. LONGMORE.

P.S.—I am sorry to say you will have to pay postage for this scribble as I cannot get stamps—the post-office has no heads; the other departments seem to be no better off.

Letter from Dr. Watt, Royal Welsh Fusiliers.

Camp before Sebastopol,
February 3, 1855.

Sir,—Having observed that the 33rd Regiment sent away upwards of twenty sick yesterday on the baggage horses of the regiment, I have the honour to request that you will be pleased to obtain the sanction of Dr. Hall, the Inspector General, for my being allowed also to send away my sick, who are able to bear removal, in a similar manner.

I would call your attention to the enormous amount of mortality (ninety-four deaths) which has occurred in my regiment during the past month. I need not say how much the presence of such an amount of disease must infect the healthy men. I have not room in my hospital for all the cases requiring treatment, and many men have died in their tents during the past month. The 7th Fusiliers have during the month sent away about seventy men in the same way as the 33rd Regiment, and I am of opinion that if I had been able to send away men when first affected by disease, that very many lives now lost would have been saved.

I would also advert to the almost entire absence of medicines which, as you are aware, exists. With the exception of opium, sulphuric acid and turpentine, I still am without any astringents, and many medicines I consider indispensably necessary for the treatment of dysentery and diarrhœa are also wanting. I have not tried the treatment by means of charcoal which was so kindly suggested by Dr. Hall, as I have never seen it used in dysentery, and in reference to the books in my possession, I cannot find any description as to the manner in which it is desirable it should be used. I should feel much indebted if I could be informed how this remedy should be given, as in the present dearth of medicines any addition to our supply would be a great boon.

I have the honour to be, Sir,
Your obedient humble servant,
(Sd.) W. G. Watt,
Surgeon R. W. Fusiliers.

Dr. Alexander,
Deputy Inspector Gen. of Hospitals, &c., &c.,
In Charge—Light Division.

Camp above Sebastopol,
March 29, 1855.

MY DEAR BIRKETT,—I received your letter of the 9th inst. to-day. I write a hasty line to let you know that I have sent you two packages of the veritable Crimean pediculi. I don't know whether they will survive the voyage, but perhaps they may, and they may then be of some interest perhaps as evidence before Mr. Roebuck's committee. They are not likely to multiply and spread among you clean people in London, as they seem especially engendered by dirt and neglect. They infest the woollen clothes first, afterwards the person, and have no particular fondness for those parts of the body covered with hair. (When a man has had the head, &c., infested with vermin, as well as the clothes, the lice have been distinct in species.)

The lice so much talked about in the Crimea are of the same family, I believe, as those which infested our troops in the Peninsular—at least an old Peninsular officer told me so. The pediculi I send you were as common and seemed to thrive nearly as well on the ground for some time as on the clothes, and the officers, who had to lie down in the trenches where also the men were in the habit of lying, got them in this way in considerable numbers every time they went on duty in the trenches. They multiplied with marvellous rapidity in the clothes and persons of men who became anæmiated and much debilitated—and the increase of vermin, and increase of debility, by mutual co-action, went on at last at geometrical ratio until death carried off the man. Putting out flannels for a couple of days in snow destroyed the lice, but not the ova, and it was very difficult to get rid of them as we had no means of boiling or baking the clothes. The larger lice burst from the effect of the cold when placed in snow, others became shrivelled up.

Here is an epistle on rather a curious subject, and you should have witnessed the surprise of a military friend of mine who took up one of the small parcels directed to you when I announced to him the contents.

The pediculi when packed up were alive and seemingly thriving, they are still tenants of their native flannel, and are stowed away not so tightly as to interfere with their comfort

in two empty match boxes. To obviate any chance of escape, I have carefully pasted them up with a covering of white paper, more particularly out of consideration to Watt, who is the bearer of them to you.

Believe me,
Very truly yours,
(Sd.) THOS. LONGMORE.

[EXTRACT.]

Camp before Sebastopol,
April 1, 1855.

. . . . You fancy we army doctors have much more power than we have. The use of the stiff stock has been remonstrated against for years—was particularly objected to in Bulgaria—and common sense as well as physiology oppose its use. It may be useful to old men to support the head—the Duke of Wellington was compelled to wear several stiff rollers round his neck of late years with this object, but it is most objectionable for troops on the march or engaged in active exertion. But what avails one writing or speaking? Sir G. Brown has ordered the commanding officers of his division to procure them for the men immediately, and I presume if you enquire of the Army clothiers you will find they have been sent and are already on their way to us. So with the chakos—they are to be restored at once, and the men who have lost them are to pay for new ones—rather a hard case, for they were ordered not to wear them in the early part of the winter, as the height and brass ornaments made them conspicuous objects for the enemy's riflemen when they went into the trenches. They had no place to put them, and usually stuck them on their arms as they were piled in front of the tents. The wind took some, and from various reasons in the end all were lost.

The French leave their chakos at home, and bring into the field a neat, light and easy casquette. But all this will be remedied *by-and-bye*, I suppose.

Camp above Sebastopol.
April 30, 1855.

MY DEAR BIRKETT,—You good people at home are treating us regimental surgeons very cruelly. You are establishing civil hospital after civil hospital, sending out men at immense

salaries, and stopping that which is the only prospect of advantage open to us—our promotion. No distinction; let a man be able to afford proof of having done his duty, it is all the same, the civil surgeon comes and bars his progress. And look at the disproportionate compensation. There is now stopping with us a very young man—a brother of one of our officers—of the name of Rooke. He is assistant surgeon in the Dreadnought, and that berth is to be kept for him till his return. His expenses have been paid out here—he gets £2 2s. a day—field officer's allowance—and is to have a year's salary given to him when he leaves. Look at the salaries of the medical officers in the civil hospitals at Smyrna and on the Bosphorus. Dr. Lyon with "a liberal outfit, travelling expenses, £100 per month, and a year's salary on leaving," to make autopsies and report on prevailing diseases. So says the *Medical Times*, and more civil hospitals are to be established. Look, on the other side, at a regimental surgeon like myself, and after twelve years' service, of which six have been abroad, not including the present campaign in Turkey and Crimea—two of those years in some of the worst parts of the West Indies—I am getting 13s. a day, minus income tax, regimental deductions, and less allowances than a captain in charge of a company. All the risks of the campaign with none of its honours and advantages—not even the chance of promotion now. It is true that after twenty-five years' service I may get a retirement of 13s. or 15s. a day, but is that adequate as compared with the chances of my not reaching that period of service?

I admit fully all the shortcomings at Scutari and in the field, but depend upon it the medical officers for the most part have not been to blame. You are not punishing the right parties, and never will, I fear—so much power and influence are against it.

Dr. Davy, whose name was mentioned in the House of Commons the other night, in a letter to me some time since, asked if I had kept notes on certain subjects. I have transcribed for his perusal some of my letters to the military and medical authorities, of which I have fortunately kept copies, to show that I have not been blind to the numerous causes of disease which we had no means of averting, and which I

am sure no civil surgeon under similar circumstances could have either averted or counteracted. I should like you to look through them if you have time, and when you have done so, will you be good enough to post them to Dr. Davy's address, which I will enclose? I have not time to make a copy for you, or would do so. I suspect you would find, if you had the opportunity of doing so, that there have been very few Guy's men out here who have not been not only fully alive to the evils the Army was subjected to, but also independent enough to do all they could do—namely, to represent and expostulate in the proper quarter.

Believe me,

Very truly yours,

(*Sd.*) THOMAS LONGMORE.

[EXTRACT.]

Camp Sebastopol,

October 4, 1855.

. . . . I sent away five invalids to-day to England, Chatham, I suppose. I will send you notes of one or two of the cases next mail. I have had twenty-four documents to write out with these five men! *One* for all practical purposes should have been enough.

Camp Sebastopol,

February 12, 1856.

. . . . I hope the new warrant will do something for the assistant surgeons as well as all of us. They have lately sent out uneducated dispensers, without any diploma—mere druggists' boys—and given them the same pay and allowances as assistant surgeons, with the only difference, indeed, that they rank as ensigns instead of lieutenants.

Camp Sebastopol,

November 14, 1855.

December 1, 1855.

MY DEAR BIRKETT,— . . . . The fearful explosion has stopped my doing anything further. I will try and send you Green's case next mail. We are close to the siege train. I was knocked over as I sat writing at my table, the roof of my hut wrenched up, a skylight window driven in, door

knocked off the hinges. A shell must have burst just over my head, for the fragments fell on both sides of the hut, and one large piece struck the wall. The uncertainty of what had happened, and was happening, was very awful; it seemed as if the whole ground has been undermined, and the Russians were blowing us all up together. One piece of shell went through my servant's tent close at hand, another went through my stable. Another shell knocked part of the roof of my hospital kitchen away, a shot went through one of the hospital tents, every pane of glass was broken, and the roof of one of the hospital huts was lifted up—yet only one man at the hospital was struck, and he not hurt seriously. Most of my regiment were fortunately out of camp. Had the English powder-mill blown up there would have been no escape for us.

Believe me, very truly yours,
(*Sd.*) THOS. LONGMORE.

Camp Sebastopol,
January 14, 1856.
February 26, 1856.

MY DEAR BIRKETT,—. . . . I thought over the remarks in your last about the Professorship of Military Surgery. Perhaps a few words from an army doctor might be useful in one of your London publications on the subject. I'll therefore sketch out a few lines in reply to your remarks. If you think them worth sending, send them as written to yourself.

I quite agree in what you write about "Lectures on Military Surgery." A course of lectures on Military Surgery, using the word in its strict sense, cannot be required in a school where a chair of surgery already exists; for the science of surgery admits of no speciality; its essential principles must be identical in all places, and under all circumstances. But yet I think it right to have a distinct course of lectures for army surgeons, in addition to the general courses on surgery and medicine, in the Metropolis. They ought not to be called "Lectures on Military Surgery": such a term serves only to mislead. I cannot suggest a phrase comprehending in its meaning the full nature of the subjects which should be embraced in this course of instruction. The term "Military Sanitation" comes nearest to it to my mind; for *Militum de sanitate tuenda* must be

the topic of the Lecturer's discourse, in all its parts and bearings, and the word *Sanitation* will equally refer to organic and physical soundness—to things medical and things surgical. Some new term is required to include all the considerations which ought to enter into the mind of a military medical officer, arising from the peculiar duties, habits and circumstances of soldiers, and in reference to the diseases and injuries to which they are especially liable. A military surgeon has much to learn, although he may have studied diligently at hospital, and gained his diplomas of medicine and surgery. The civil life, the attention and habits of thought, are directed more particularly to the diseases of the home climate, and the circumstances of a highly civilised community. Another train of mind is necessary for the army surgeon, who may at one period be treating his patient in the Tropics, at another in a region of excessive cold, such as certain parts of North America; at one time in the life of march, at another on board ship; now in a make-shift cantonment, now in a camp; in a friendly country, or before the enemy. Circumstances connected with transport, means of attention, opportunities of after-treatment, modify military practice; and what might be a judicious surgical proceeding in civil life, might be very injudicious in the field. The adjoined extra-professional duties of the military surgeon are a study in themselves. The rules of the service, the exigencies of military discipline, the mode of carrying on the medical duties, the administration of hospital affairs varying in different colonies, the complicated connections of the medical with the other departments of the army, have to be learned and acquired. I have often experienced myself, and observed in others, the delay and difficulties arising from deficient information in some of these respects. The preliminary month or two spent at Chatham only gives the opportunity of learning, or at least used to do so, the formal mode of keeping registers, examining recruits, and a few routine duties. Each officer, therefore, gaining his knowledge by personal experience, learns by degrees what meets him in the accidental sphere of his employment, and occasionally commits blunders when brought into new situations from want of a more extended knowledge and direction. An initiatory exposition of all these matters would render the tyro independent of acquiring an insight

into the army medical economy by the slow, and oftentimes expensive, lessons of experience. Many mistakes and much correspondence would be avoided; knowing all that had been done already, he would be in a better condition to advance and improve. It would be the Professor's duty to keep pace with the progress of the time, and to explain to his class the changes which are daily occurring in the rules and regulations of the military service. It would be his duty, too, to point out the improvements in civil practice. Such a course as I speak of, to be really valuable, should be given at the head-quarters of the Army Hospital establishments, where all the stages in the career of the soldier could be observed, from the examination of recruits, to the final discharge of the worn out and invalided. This is carried out in perfection at the Val de Grace in Paris, where, from the completeness of the system, the lectures and demonstrations are nearly as beneficial to the advanced military surgeon returning from his tour of colonial service, as to the younger one just entering the profession.

There is another point of view from which the military medical officer should be regarded. He is a veritable sanitary commissioner. His province is as much to prevent disease as to cure it. He has to search out and neutralise its sources, to arrest its progress when an outbreak occurs. In civil life the surgeon or physician treats the cases in which his advice may be asked; it is the duty of others to perform the offices I have just mentioned. Soldiers require constant watching, for their own sakes as well as for that of the country at whose cost they are maintained. Few of them have the necessary knowledge or care, even of self-preservation, beyond the common animal instincts; none of them have any knowledge of the many essentials to be attended to in order to ensure a general safety when they are herded together in masses. Even intelligent military officers who have not thought on this particular subject, often hold very limited or mistaken ideas respecting it, and I believe it would be for the benefit of the troops if the medical officers had more direct influence than they have in matters of sanitary influence. I know, during one campaign, at least, that in one division of the Army, no medical officers were consulted with regard to the arrangements of the encampments and other points, when suggestions, such as ordinary

sanitary science would have dictated, might have been of vital importance.

I think I have written enough to show you that military surgeons do absolutely require a course of teaching and study, after they have become familiar with lectures on surgery, and surgical practice at a civil hospital, and even after they have become members of a College of Surgeons; but it is certainly a misnomer to give to such a course the inexplicit title of "Military Surgery." The particular considerations connected with the military practice of surgery can only form but a limited section of the course.

There, will the above suggest any epistolary comments from yourself in the form of a letter to one of your journals? I suppose many would say that the term hygiene—is that the way to spell it in English?—would be significant enough. It is not, however, to my fancy, because, although meaning preservation of health, it would not include the physical part—your gunshot wounds, &c. If you write anything about it let me see it.

Our amputating knives are packed up for the present, and the stethoscope is in the ascendant, catarrhs, bronchitis and pneumonias are the order of the day. *Coups d'air*, as the French call them, and leakage, in the expensive but ill-fitted huts sent out, and bad boots, are the apparent causes. The men are so well fed and clothed, and consequently in such good condition, that the mortality is very limited. The French a few weeks since were very badly off—they are better now. They have had a great number of frost bites, much bowel complaint and scorbutic affection. What a bustle there will be when our winter quarters are to be abandoned. Balaklava given up—the large town of Kadikoi and its minor dependencies, Petit Kamiesch and Donough Brook quitted, the rails pulled up, &c., &c. Do the merchants still talk of peace in your parts?

Very truly yours,

(Sd.) Thos. Longmore.

REPORT OF THE ROYAL COMMISSION ON THE WAR IN SOUTH AFRICA.

As the actual volumes of this important report are unlikely to be accessible to the majority of members of our Corps, while the evidence contained in their pages cannot fail to be of interest to our readers, we propose giving a *precis* of the evidence so far as it relates to medical organisation before and during the late campaign. For this summary, which is continued from p. 231, vol. ii., we are indebted to Lieut.-Col. Edwin Fairland. It deals mainly with evidence regarding medical equipment.

IV.

(Q. 3737.) You have been asked about a sanitary authority, and I gather that you recommend there should be a separate sanitary establishment from the Medical Corps? I recommend that it should be part of the Medical Corps . . . . there should be special sanitary officers attached to the Army in the field for advice . . . all the doctors attached to the A.M.S. are thoroughly trained sanitary officers.

(Q. 3741.) If they are all thoroughly trained in that way, what is the exact necessity for having different officers to carry out these duties? It is a great thing to have a few men going about who are of undoubted European authority to say that such and such a thing ought to be done. It is just like sending out Sir Wm. McCormac, who was an undoubted authority on military surgery; there were a great number of other officers out there who could do the thing just as well, but they were not recognised as the great authority that he was.

(Q. 3742.) But their names do not carry the same weight? Exactly, they do not carry the same weight; what he would say about a thing would carry more weight, although the opinion of the officers would be just as sound.

(Q. 3743.) . . . . The only medical unit for the Colonial troops at first was the New South Wales Contingent, who brought half a field hospital . . . I told them to telegraph for the other half, and they brought it. The officers were thoroughly efficient, and they had one great pull over everyone else, and that is they brought their own transport with them . . . their transport was the thing for us to imitate, it was very good; they had their own horses, which were never taken from them. We simply got whatever we could. It was taken away from us and given to us, and we just got what was left. . . On the advance to Kroonstad, the New South Wales Field Hospital was the first in the field to the relief of the men—because they had their own transport—they had their own horses, and that was the great thing.

(Q. 3750.) Why should not you have your own horses? Of course transport is always the difficulty. . . . The General wants food for his men, and he would want a very large establishment of transport if we could keep our horses and mules as we ought to keep them. I quite see his point, but until we do get our own regular, steady, trained horses we will never be efficient and able to move like the New South Wales Hospital, who had theirs.

(Q. 3752.) Do you think economy is a matter which ought to come into consideration in a case of this sort? No, but still, although there was no economy in South Africa, we could not do it, as the animals were dying by thousands.

(Q. 3753.) How do you account for the New South Wales unit being able to keep their horses apparently in good condition? They were with them, and had the same men caring for them, whereas the other transport was under any drivers. They brought their own horses in the ship with them, and always watched them, and took more care of them than any ordinary driver picked up anywhere would.

(Q. 3755.) Surely if that could be arranged in New South Wales it could be arranged here also? If it could we would have a very different story to tell.

. . . . We had plenty of the ordinary hospital clothing . . . there was a new departure made in South Africa, every man going out of the stationary hospitals was supplied with an issue of new clothing free. We generally had to burn his old clothing.

(Q. 3762.) I notice in this report—I do not know whether your attention has been drawn to it, and have no doubt it is capable of explanation—on page 56, it speaks of the total number of sick and wounded sent down from the front in ambulance trains and the total number sent down in ordinary trains. The number sent down in ambulance trains was 11,865, and of these 14 died in transit and 20 died within two days after their arrival at the base. Now, 10,867, that is 1,000 less, were sent down in the ordinary trains, and of these none died in transit, and only one died within two days after. What is the explanation of that? Only bad cases were sent in the hospital trains. As to the ordinary trains, we used to get a whole lot of empty trucks or carriages, . . . and put mild cases into them—men fairly well.

(Q. 3672.) Who were absolutely convalescent? Yes, who were on ordinary diet for some time. We put these men into those trains with a medical officer and a few attendants, and sent them down country. The ambulance trains, of course, were taking the wounded off the field, and I have seen them die in the ambulance train. That is the explanation.

(Q. 3675.) Do you know whether the R.A.M.C. was kept up in England to a state fit for three Army Corps? Oh no, it was not

anything like up to three Army Corps. It was never intended, I think, to keep it up for more than two Army Corps and a Cavalry division.

(Q. 3676.) Was it kept up for two Army Corps and a Cavalry Division, besides providing for the ordinary work of the garrisons here? Nothing like it. I think the numbers before the war were about 2,700 N.C.O.'s and men for all duties.

(Q. 3778.) What ought to be the staff of officers and men for three Army Corps mobilised? A division is about 40,000, and I would say a division, allowing for 10 per cent. of sick, ought to have 1,800 N.C.O.'s and men.

(Q. 3779.) How many officers? I do not know the number exactly, and it would take some time to calculate from the tables. . . You will get that information from Col. Wilson.

(Q. 3781.) You say you wanted 9,000 men on the Cape side; at what period of the war was that? About February, 1900. . . . . At that time there must have been 160,000 or 170,000 men in the field on the Cape side.

(Q. 3785.) You said that what occurred in South Africa will probably never occur in any other part of the world. Are you there referring to the prevalence of typhoid or enteric? Enteric will always occur, I think, in an army; but I do not think we will ever get a country so prone to it as South Africa, and where there was no means whatever locally of providing any check. It is like a desert, and everything had to be taken into it.

(Q. 3787.) In your experience, which is a very long one, have you ever known such an outbreak of enteric in an Army as occurred at Bloemfontein? There were worse outbreaks than that in other armies; in the American Cuban War there was a very bad outbreak, and that occurred just recently. . . . We had a bad outbreak in Egypt in 1882.

(Q. 3790.) Having those two cases before their minds, was there any special provision made for the chance of an outbreak of enteric in South Africa? Yes, I always looked forward to it and feared it. At first all that was done was that Pasteur-Chamberlain filters were sent with the troops, but the supply failed. Every company was supposed on going out to carry its own filters, and the officers were supposed to see that the men got filtered water from the Pasteur-Chamberlain filters, but so many troops went out that the trade was not able to supply them. . . . The British soldier is very curious. I have known him have a pipe of good water and a pipe of bad water alongside each other, one of them being marked unfit for drinking and the other good, and yet he would just as likely take the bad. If you ask him he says he has seen the notice that the one is for drinking; but the other looks clear, and he does not see why he should not take it. I have

known a soldier force a native sentry at Pretoria to drink out of a stream, while there was a stand-pipe of good water alongside of him. . . . When troops are moving you cannot boil (water). You have to watch the troops constantly that they do use the boiled water; they have a great objection to it, as it is insipid, and they do not like it.

(Q. 3796.) With regard to the open trucks, is there much difference between the day and night temperatures in South Africa? A tremendous difference; as soon as the sun sets the temperature falls suddenly. . . . The men were provided with great coats and blankets. . . . we had all the movements in open trucks during the dry weather. I do not remember any case of rain.

(Q. 3802.) Were the civil surgeons placed in charge of your own R.A.M.C. orderlies? Most of them were doing duty under a R.A.M.C. officer. In the surgical division, for instance, a R.A.M.C. officer would be placed at the top and the civil surgeon would get so many patients under him.

(Q. 3824.) Had you any carts belonging to your department constructed as they are in America of light hickory wood? We had the hickory carts that came with the Canadian Hospital. . . . They were good and did not break down as long as they were in the field.

(Q. 3827.) In connection with the transport of the A.M.D. that is following a movable column, they are supplied with the horses to draw them by the transport department? Yes, . . . the transport department drive them and are practically answerable for them. . . . Those transport officers fall under the directions of the general military organisation, and when they have done our work they are taken away from us at once. On the Natal side they were not taken away; there was a difference there as they had any amount of transport.

(Q. 3832.) How long before the war were you appointed P.M.O. in S. Africa? I got my orders about a week before—about October 7—and I sailed on October 14. I got a private intimation that I might have to go, but at the same time I was told that there would be no war; I was like everybody else in England.

(Q. 3840.) What I want to get at is this. You told us, and we know from sad experience now, that South Africa has special conditions, especially that enteric is endemic there. Supposing that three or six months before you had received a sort of provisional intimation that your services might be wanted, and you had been told to turn over in your mind what you would specially like to recommend should be sent out in view of the conditions of the country, do you not think you might have made a great many useful suggestions? I would.

(Q. 3841.) That is to say, supposing the authorities had exercised in that one department the foresight which civilian men of business

exercise in their businesses, some advantages might have been gained? I always thought that I could have made some suggestions. . . .

(Q. 3844.) As a matter of fact no suggestions were asked? No.

(Q. 3845.) And no opportunity given for making suggestions? None; I was told: "Here is the Army Corps and here is the number of Bearer Companies and field hospitals; here you are." I got it on paper.

(Q. 3848.) I presume it is the business of the A.M.D. to give advice and instructions on those subjects (water questions) to British officers? Yes, it is done in the regiments; each one going into the field has a medical officer, and he advises the Colonel what ought to be done. Regimental and Brigade orders teem with sound advice. These are read out to men on parade. There are very great differences between medical officers; for instance, some regiments were very healthy, and I put it down to the medical officer and the Colonel seeing things with the same eye. In the case of other regiments which were not so well, I think it was very often the fault of the medical officer. . I think every regimental officer ought to know the ground work of hygiene . . and see that the men carry out the recommendations. . . . The men coming home from South Africa knew a good deal about sanitation, and it was mentioned how ignorant the men at home here were on the same subject. The others had learned by experience.

(Q. 3865.) Is it the practice in the A.M.D. for officers to be sent to study the medical improvements in the armies of foreign countries? Some of them do, but others do not.

(3687.) Is encouragement given for that? There is no award or examination to pass in it. . . . Under the new system coming out now that is one of the things they will be examined in—the customs and regulations of foreign armies.

(Q. 3870.) That just brings me to the new arrangements. You are aware that under the new Order in Council, since 1901 the Director-General of the A.M.D. has been given a very high position? Yes, a better position.

(Q. 3871.) That, one must assume, must have been done owing to the discovery that everything was not what it ought to have been? Yes, there is no other conclusion we can come to.

(Q. 3872.) I think that conclusion must have been based on reports of yours from the front? I think not; I never made any complaints about my own department.

(Q. 3873.) I put to you whether the waking up of the War Office to the fact that things were not quite right must not in some way have resulted from reports by you? No doubt I struck out a new line in various ways the very moment I got there.

(Q. 3874.) I do not think you quite grasp my point. I cannot

imagine that a large change such as this would be made at the War Office unless the authorities had become satisfied that the previous system had been wanting, as proved by the war. And I put it to you whether you did not write home reports pointing out defects in the A.M.D.? I wrote home generally, and I sent a diary, and a great number of things might be got out of that.

(Q. 3875.) Can you remember sending home any special confidential reports in which you deplored the state of things as concerned the A.M.D. out there? I think at various times I have deplored I had so few.

(Q. 3876.) Any other points? Have you your diary? I have not; it is in the War Office.

(Q. 3877.) Could you by consulting that find out when you sent home any statements showing the failure of the A.M.D. in certain things? I do not think I ever sent home anything about a failure. I had reported that I wanted more officers, N.C.O.'s and men; and I have been more or less swamped with the outside element.

(Q. 3878.) You see my point. It is that it seems improbable that a great change like this could be made in the organisation of the War Office unless there had been some failure? I am afraid I cannot help you.

(Q. 3879.) You said you would like to see your own transport in the hands of the R.A.M.C.? I do not want to have the driving of it, but I would like to have it allotted to us; . . . . allotted to our units, and left there during the war. I have been misunderstood before on the same question. I do not want to have them handed over so that a medical officer would be the commanding officer of the drivers; but I want to have the medical transport always there, so that we should not have trained horses one day, and bad horses or vicious mules another day. I would like to have trained steady animals always at the command of the hospitals.

(Q. 3882.) I wanted to know whether you extended that desire to the supply of stores which were now supplied by the A.S.C. and the Ordnance? No; that is working very well, you could not improve upon that.

(Q. 3883.) Was it ever said that the Boers had better ambulance waggons than we had? If it was, it was not true. . . . The Boers had no ambulances of their own.

(Q. 3889.) Were the New South Wales ambulance carts or waggons of a special pattern, or were they of the English pattern? They were rather light. I remember when Col. Williams landed them at Cape Town, he looked at them along with our Mark V., and he changed them and took up a lot of Mark V. instead. He left his own waggons doing duty at Cape Town, because he thought they would not stand the country. They were light, and they stood Cape Town very well.

. . . Later they worked very well (up country), but they were not so good as Mark V. . . . . I do not think a good waggon to carry wounded men will ever be made.

(Q. 3894.) Would you mind stating the argument (*re* expert sanitary officers ?) The main argument is that these experts make some absurd recommendations. For instance, an expert sent a memorandum to me that I should have a tube well at every post in South Africa—which would have meant for the blockhouses alone 7,000. I laughed over the suggestion when I got it; but did not like to answer it myself, and passed it on to the engineers. They sent it back to me, and said, "You might have answered it, as you know perfectly well it is impossible, the bulk of the ground being rock."

(Q. 3895.) Then there is a second objection raised by very high military authorities. They say that if you have your expert sanitary staff the regular medical officers when asked for an opinion on a sanitary subject will endeavour if possible to throw the onus on the expert ? They will.

(Q. 3896.) Who will not be on the spot ? Yes.

(Q. 3897.) How do you propose to meet that difficulty ? As it was, I was looked on as the senior sanitary officer in the Army out there, and it will always work in that way if you put a sanitary expert on my staff.

(Q. 3898.) Do you not think that the ordinary medical officer would rather object to giving opinions when there is a special expert to deal with sanitary questions ? I do not think he will object, but I do not think he will be as keen if he knows there is a regular sanitary service.

(Q. 3899.) How will you get the ordinary medical officer to act as a sanitary officer, as he does now, if he always feels that there is a bigger man behind him ? I think as long as you have a R.A.M.C. sanitary officer attached to the staff of the P.M.O. that the difficulty will be met.

Reviews.

LABORATORY STUDIES IN TROPICAL MEDICINE. By C. W. Daniels, M.B., M.R.C.S. Pp. 352. Bale, Sons & Danielsson, Ltd., 1903.

This volume more than justifies the modest claim set forth by the author in his preface, namely, that it is "to assist practitioners in the Tropics in the application of simple laboratory methods to the practice of medicine." The expense and the special knowledge required to start even a small laboratory must frequently act as deterrents to those who, otherwise, would be glad to follow up and extend research on modern lines in Tropical Medicine. To all such Dr. Daniels' book should prove of the greatest assistance, as well as to those who only wish to avail themselves of the most recent aids to the diagnosis of tropical diseases by laboratory methods. Many practical hints and devices are given, by following which the use of expensive and complicated apparatus may be dispensed with, and there are few subjects in connection with the diagnosis and investigation of tropical diseases which are not described with sufficient detail to enable the reader to carry the methods out for himself without further assistance from books or from experience.

Malaria and mosquitoes naturally occupy a large portion of the book, and a chapter on "Biting-mouthed, Noxious and Parasitic Diptera," contributed by Mr. F. V. Theobald, the author of "A Monograph of the Culicidæ of the World," should prove of great value in view of the important *rôle* played by these insects in the transmission of many tropical diseases. The various other parasites associated with tropical diseases—entozoa, filariæ, trypanosomata, &c.—are fully described, and the book concludes with a short account of bacteriological methods, which we think, however, will scarcely enable the reader to dispense with the use of a fuller text-book on this subject.

The book is well illustrated and some excellent coloured plates of stained leucocytes and parasites give a much better idea of the appearances met with in practice than is to be obtained from black and white sketches.

We notice an error in attributing to Dr. G. H. Wright, an American worker, the methods of estimating the coagulability of the blood and the serum sedimentation test devised by Dr. A. E. Wright, late Professor of Pathology at Netley, but on the whole the information given is very accurate and clear, and we can confidently recommend the book to those who are brought in contact with tropical diseases. In later editions we think Dr. Daniels would be well advised to give references to recent work, as this, in our opinion, would add greatly to its value.

W. B. LEISHMAN.

THE PRACTITIONER—SPECIAL NUMBER—ENTERIC OR TYPHOID FEVER. January, 1904.

The casual reader, on glancing through these pages, might easily be excused if he believed that the whole question of the causation and

dissemination of enteric fever in England had been definitely worked out, and that it was only in tropical or sub-tropical regions that any doubts or difficulties remained. Nor would the title of Dr. Newman's article on "Channels of Typhoid Infection in London" raise any grave suspicion in his mind. It would, therefore, be with considerable surprise that he read the concluding paragraph of this article, hesitating in its terms, and tentative in its suggestions.

"If it be true, as would appear, that the case-rate for typhoid fever in London remains fairly constant year by year, and at the same time water-borne infection is not the chief channel, it seems reasonable to conclude from the above facts that personal contact and polluted food (especially shell-fish) are the main channels of infection. In any event, a case seems to be made out for further enquiry on these two lines in any investigation into this disease, and for a study of the direction which preventive measures should take."

If he happened to read the *Lancet* of January 16, his feelings would be still more upset on finding that the bacteriological foundation for the theory of infection by shell-fish has proved less stable than was supposed. (Fourth Report of the Royal Commission on Sewage Disposal.)

If such uncertainty prevails under the very nose of the Local Goverment Board, in the centre of sanitary science and organisation, how, he might ask, is it to be expected that less favoured climes should show more definite results?

The earliest scientific summary which exists of the whole of the facts concerning the prevalence of enteric fever, and the conditions associated with it in tropical or sub-tropical climates, is contained in a paper in the Army Medical Reports for 1878 by Surg.-General J. H. Ker Innes, C.B., extracted from the Annual Report of the Bengal Presidency for 1877. It is not too much to say that no report has since appeared which surpasses it in breadth of view, or even in completeness, as far as the essential points are concerned. Of course in comparing it with a report written from our present standpoint, such as that by Major McCulloch, R.A.M.C., in the A.M.D. Reports for 1900, we find that the latter is much fuller in detail, and on certain points, where the earlier author arrived at his conclusion by a hard process of reasoning from a limited number of facts, modern progress in bacteriology has enabled Major McCulloch to confirm these conclusions by references to the results of bacteriological investigations.

Every article which deals with the etiology of enteric fever (and there have been many of them) contains some record of observations more or less correct, and a superstructure of theory. Theory must, of course, be judged by the state of contemporary knowledge, a fact which Dr. Andrew Duncan has apparently forgotten in holding up to derision in his article certain theories which he quotes from various sources. Earlier reports may err by the inclusion of statements which further observation has shown to be wrong, or may be incomplete by the omission of observations on certain points, but here, too, the degree of knowledge at the date of the report must be borne in mind. None of the facts mentioned in Surg.-General Ker Innes' article have been shown to be incorrect: the only points omitted are the infectivity of

the urine of patients suffering from enteric fever (a condition which of course it was impossible to differentiate from the general infectiousness of all excreta until the bacillary theory was well established), and possible soil infection, which is barely indicated. Except in these two points, no later statement is required to complete his account.

Turning to the speculative side, the article itself gives very clear expression to a consistent theory of infection (with its logical consequence, the explanation of the origin of a large proportion of the cases of enteric fever), and an equally clear statement that such a theory has failed to account for all the cases. It is difficult to see how in essentials our present theory differs from this. We know more about the possible channels of infection, thanks to bacteriology, and the residuum of inexplicable cases is probably relatively smaller than it was, but no one who has worked practically in the investigation of the causation of enteric fever is as yet able to explain all the facts on the theory of continuity. The very fact that the question of the transformation of the ubiquitous *Bacillus coli* into *B. typhosus* has been repeatedly raised, the suggested auto-infection and the development of a theory of "paratyphoid" are attempts to explain this residuum, the first two being equivalent to the old theory of origin from general contamination, or *de novo*, and the second a limitation of the extent of true enteric fever.

What help do we get from this latest utterance? In a compilation of this kind overlapping was almost unavoidable, so we find the articles by Drs. Sandwith (Egypt), Duncan (India), and Leigh Canney, each contain a restatement of facts with which we have long been familiar. In Dr. Sandwith's article we also find our old friends, "doubtful water," "water from the goulah of an Arab," "an obviously unclean pool," and "the intimate connection between this fever and insanitary dwelling places." It is of course not always possible to go beyond surmise in our attribution of a cause; whether this adds to knowledge is another question. Dr. Duncan, though somewhat more dogmatic, throws little fresh light on the older theories. Dr. Leigh Canney enters a special plea for water infection, a view that can hardly be termed new. In addition, each and all of these authors introduce our newer theories of conveyance by dust and flies, and of infection through the urine.

But as regards the general theory of causation, we seem no better off than we were twenty-five years ago. For "specific infection" and "*Materies morbi*" read "*Bacillus typhosus*," and the solution of the whole problem still remains as far off as ever. We have no doubt, through bacteriology, shown that probable channels are in fact the actual channels; we have demonstrated that infection may occur in ways formerly unsuspected; but we are no nearer to the explanation of all the features of the occurrence of enteric fever than we were.

Before leaving the question of etiology, some points in Dr. Duncan's article require notice. He reviews some (using his own epithet) "untenable theories." Historically they are interesting, and would be more so if Dr. Duncan had not altogether avoided any indication of their dates. Without these it is hardly fair to hold them up to the derision of (we hope and believe) a better instructed age. The question is, not whether these theories are untenable now, but whether they were in correspon-

dence with the knowledge at the time; apart from this, their inclusion in an article for present practical use seems a doubtful benefit. Further, it is not at all easy to understand Dr. Duncan's position as regards the occurrence of enteric fever in India, and more particularly its differentiation from other forms of fever. Dr. Duncan speaks of "many cases returned as enteric fever not being enteric fever at all." One would not take exception to this on general grounds, as relating to the milder, non-fatal fever, but here Dr. Duncan is speaking of a fatal form of fever in which the *post mortem* has shown ulceration of the intestines. He quotes Surg. Wall, I.M.S., as "concisely summing up the question." On referring to Fayrer's "Climate and Disease in India," published in 1882, one finds Surg. Wall's summary included, so that at least it does not necessarily represent the present opinion. Further, Dr. Duncan quotes the Report of the Sanitary Commissioner with the Government of India (1886) to the same effect, who uses the rather curious argument that "there is no pathological improbability in follicular ulceration accompanying remittent or any other fever." Over one hundred years ago, after we had become a power in India, our knowledge of its fevers was so imperfect that it was admissible to use an argument *a priori*.

It is hard to see what bearing the observations of the older writers have on this question. Everyone knows that ulceration of the intestines in fatal fever cases was described long before they were recognised as enteric fever; but equally, there is no doubt that the majority of these cases were in fact enteric fever. Morehead only mentions ulceration as "an occasional complication of remittent fever."

But what has become of the ulcerations in fatal fever cases which are not typhoid? Tubercle we know, syphilis and several other forms (even in Malta fever),* which are unmistakably non-enteric. One reads with some interest in this connection an article by Dr. Fulton of Baltimore, in the *Journal of the American Medical Association* (Jan. 9, 1904), in which he shows conclusively that at least half of the mortality in the South charged to malaria is really due to typhoid fever, and in the North probably two-thirds is really so due. The special Commission in 1898 on typhoid (referred to by Dr. Duncan) showed that no fatal malarial infections occurred to the soldiers in any part of the United States. Those of us who went to India in the early eighties will recollect that this question of non-enteric ulceration was then frequently debated, but most will agree that the actual *post-mortem* appearances were indubitably these of true enteric fever.

Dr. Leigh Canney's article includes a useful summary of the present knowledge regarding the channels of dissemination, provided one remembers that his main point is water infection.

Water carriage of the infection, though recognised as a possibility from the earliest days, did not at first receive that attention which was devoted to it at a later date when it was believed to be, if not the only, certainly the most important, channel. More recently it has lost much of its pre-eminence. Macé indeed speaks of the "secondary"

* Bruce, *Practitioner*, April, 1888.

importance of water carriage, as compared with infection from the soil. Without taking this extreme view, one may recognise that a too exclusive attention to water carriage has probably hindered sanitary efforts in other directions.

There is abundant evidence that the existence of enteric fever does not depend solely, nor in many places even largely, on water infection. There is much detail on this point in Major McCulloch's article already referred to, and it is specially important to call attention to the fact noted by him, that cholera is now almost entirely extinct among British troops in India (a result mainly attributable to improvements in the water supply), while, as is well known, enteric fever remains as prevalent as before. There is, of course, no doubt that water infection is a frequent cause of this disease—indeed, one is tempted to believe that no epidemic will *begin* except through this channel (compare Dr. Tooth's article, p. 48)—and that the provision of a pure water supply is followed by a diminished prevalence of disease. This was well seen in several cases in South Africa during the late war. There is, therefore, not only ample justification for any expenditure, but every inducement to spare no effort which will result in the provision of a water supply above all suspicion. One may therefore agree with Dr. Leigh Canney that this is "the most important initial step," and the methods which he recommends to the attainment of this end are those which a large experience has shown to be appropriate.

It is a logical consequence that those methods which are found satisfactory in a settled community, should, if they can be carried out, be equally efficient in the field, hence it is quite true that, as Dr. Leigh Canney says, "the rapid service of approved or safe water must be the basis of any scheme of prevention" of epidemic disease in the field. It is indeed so evidently true, that if there had not been great difficulty in the carrying out of the scheme, it would undoubtedly have been introduced before now. What these difficulties are Dr. Tooth shows very clearly in his "Reflections on Enteric Fever in Camps" in this publication.

There are three features to be considered: the method of ensuring the purity of the water, its distribution, and the prevention of the use of water other than the approved water. As to the method, sterilisation by heat appears to be the only one which has any chance of success. Filtration is not satisfactory, it fails with many waters. Chemical methods have been tried again and again, and have not proved successful, largely owing to the invincible dislike of the men to any physicking of their drinking water; and, indeed, acid bisulphate of soda in an iron water-bottle produces that flavour of warm flat irons which Mr. Sam Weller detected in the Bath water.

What Mr. Ernest Hart called the "policy of the tea-kettle" is no new thing. There is often a positive advantage in an imperfect knowledge of all the conditions affecting any subject, and Dr. Leigh Canney has been, and is, a more powerful advocate of the boiling of drinking water in the field than it was possible for any one with a fuller knowledge of the conditions to be (*vide* Dr. Tooth's article). It may be true that all the difficulties can be overcome; so far, the matter has

not got beyond the experimental stage, and further experience may show that it is possible to cut down the necessary equipment, and so obviate the large addition to transport which is at present required by the scheme.

Quite apart from this material difficulty regarding the actual provision of approved water, the distribution is by no means a simple matter. Any further addition of non-combatant *personnel* (such as a Water Corps) to the Field Army, is a very serious matter. Nor is the attitude of the soldier a lesser difficulty. Using the expression of an officer of much experience and common sense, the soldier "dislikes being badgered" about his drinking water. Under the present conditions, compulsion may be possible so long as the soldier is under the eye and command of an officer of his own Corps. But under other circumstances, which in a campaign like the South African War, were not at all exceptional, compulsion will neither be attempted nor carried out. This avoidance of anything but approved water will not be practicable until the officer and soldier have learned its necessity, not in compliance with an order, but as a voluntary act.

However, while recognising all the difficulties, there is every reason to wish that the method may be given an extended trial, as nearly as possible under service conditions. Further, it seems advisable that during this trial the actual incidence of disease among the corps using this method should not be scrutinised too closely. On the one hand we have sufficient evidence of the importance of a pure supply, and on the other, our knowledge of other causal conditions is as yet so imperfect, that we are not able to exclude the possibility of some other intervening agent. Hence it might happen that in a comparatively limited experience, disease, the result of other conditions, might be attributed to the failure of this pure water system. We have also, and for the same reasons, to guard against promising too great success from the adoption of this scheme. An American philosopher has said, "Never prophesy unless you know," and recommendations based upon what we are pleased to call sanitary science have received less attention than is desirable because this very useful maxim has been forgotten.

One may note also that the tone of the proposals of the non-military sanitary experts, which recent events have brought forward so strongly, goes far to justify the attitude adopted by Lord Wolseley towards sanitary officers. Heretofore, the immediate object of war has been regarded as the defeat of the enemy as soon as possible, and for this sufficient food to keep body and soul together, and as much ammunition as was available, have been regarded as the two absolute essentials in emergencies—everything else was secondary, though admissible and even desirable when possible. One can easily recognise that the admissibility and desirability could, with much advantage, be altered to absolute necessity when circumstances render it at all possible, and no efforts should be spared to hasten the recognition of this necessity. But the position adopted by some is much in advance of this; they seem to suggest that the whole operations should be delayed, even in emergency, till all desirable conditions are actually complied with. This is, of course, so material an alteration in the whole theory

of war, that its acceptance is more than doubtful, and, indeed, proposals of this nature do much to hinder the acceptance of lesser and more practicable schemes.

With regard to Dr. Leigh Canney's concluding paragraph, the fact that the complex sanitary organisation of England had complete control over the incidence of enteric fever in this country, would do more than any argument to convince the British Army that this is a preventable disease. At present this weighty argument is wanting.

Mr. Cantlie and Dr. Sandwith both bring forward evidence of the comparative immunity of the indigenous races (in China and Egypt respectively) to enteric fever while living under their normal conditions, but Dr. Sandwith points out that this immunity is lessened when the Egyptians are brought into contact with Europeans, and similarly Mr. Cantlie shows that Chinese children easily contract the disease by infection from Europeans. Dr. Duncan also refers to the supposed immunity of the natives of India. This has been shown to be less marked than was formerly believed to be the case, and probably a more complete knowledge of the diseases of the natives both in Egypt and China would have the same result. The immunity of the native population is of course only an extreme case of the relative immunity which residence (without attack) is supposed to confer on Europeans, and a more complete knowledge of the circumstances under which this immunity breaks down is much wanted.

As regards diagnosis generally, the important contributions are the Editorial note pointing out that Widal's reaction is not the infallible test that it was believed to be, a view that will commend itself to all who have experience of it as a routine test abroad, and Dr. Hewlett's article on "Paratyphoid."

Faith has been defined as believing what you know is not true, and it has been in faith that observers have returned some cases as enteric fever, some as simple continued fever, giving each term a greater extension than was warranted. The differentiation of "paratyphoid" is the first step towards clearing up the difficulties in the diagnosis of the several continued fevers that in some respects simulate enteric fever, and it is some confirmation of the views of those, a considerable number, who hold that all continued non-malarial fevers of warm countries ar not necessarily enteric fever.

Dr. Tooth's article, already referred to, is a valuable account from an eye-witness of the difficulties which lie in the way of complete protection. The soldier is much blamed for his carelessness in sanitary matters, but quite apart from the question of physical impossibility in many instances, one cannot expect a body of men, some of whom will meet with a violent death on the morrow, to take much trouble to guard against the remoter consequences of infection.

Professor Wright's article on the theoretical basis of antityphoid inoculation, is extremely interesting. The whole subject, however, is at present *sub judice*.

The remaining articles deal with the treatment of enteric fever. The main points, as noted by Sir William Broadbent in his introduction, are the necessity of avoiding too great interference with the natural

course of the temperature, over-feeding and over-stimulation, and it is in these points that ordinary practice seems to err by excess.

The whole section on treatment is very valuable, both in suggestion and in the support of those who at times are blamed for doing too little by the older school who demand active measures—and here one agrees with Sir William Broadbent, that "these papers will furnish important reading to medical officers going out to India or Egypt."

Those of us who want fuller details as regards prevalence and etiology, will, however, find very complete accounts in the Army Medical Department reports, and as regards India especially in the article by Major McCulloch already referred to.

R. J. S. Simpson.

The Causation and Prevention of Malarial Fevers. By Capt. S. P. James, I.M.S.

This pamphlet is, as the title conveys, "For the use of Assistant Surgeons, Hospital Assistants and Students." At the same time there is much in it that will well repay study by the young medical officer arriving in India for the first time.

The author gives first an account of the life history of the malaria parasite in man and in the mosquito; he does not confuse his readers by discussions or arguments on the various points, but states clearly his own convictions and leaves the student to verify them for himself. The next portion of the pamphlet is most useful, containing as it does descriptions of the general characters of the mosquitoes and of the character of the anopheles genus in particular; the differences between culex and anopheles are categorically stated, and directions are given for collecting, mounting and examining mosquitoes. A short table is added by means of which the observer could classify the species of anopheles among his captures. Then follows a description of the most usual breeding places of anopheles.

It is a pity that the author did not reprint here his excellent description and diagram of the dissection of a mosquito which was published in the "Scientific Memoirs of Officers of the Medical and Sanitary Department of the Government of India, New Series, No. 2."

The next part is devoted to the enumeration of the characteristics of the malarial fevers and parasites in India; much of the author's work has been done on native children, in whom the disease pursues its normal course unchecked. The young officer must not expect to meet such typical cases among soldiers in Station Hospitals.

The author believes in the theory that the rise of temperature is due to a "pyrogenetic or fever-producing body," manufactured in the red cell by the parasite and which is set free on the rupture of the red cell; but in speaking of malignant fever he says, "Their number," that is, the number of sexual parasites, "gradually increases and they are very abundant after the fever has just left the patient. It is certain, therefore, that these sexual forms have no connection with the production of fever." Yet at another place the author states his belief that the crescents do not escape from the red cells in the blood of the inter-

mediate host, nor does he advance any theory to account for the secondary fever in these cases.

The author is sound in his directions as to treatment; he warns against administrating quinine before the diagnosis has been confirmed by a blood examination; not only a diagnosis of malaria, but also whether the case is one of benign, quartan, or malignant, and states that "all these points are very important, because it must be remembered that malaria, like syphilis, requires many months of continuous treatment for its complete eradication. As soon as a diagnosis is assured, it is best to begin quinine at once, irrespective of the stage of the fever." It should be noted, however, that quinine acts best on the parasite when it has escaped from the red cell.

He then goes on to discuss prophylaxis and gives a most interesting synopsis of the methods that are being used in India for the prevention and extirpation of malaria. Some excellent hints on individual prophylaxis are given. An appendix on methods of blood examination follows, and should prove useful to those for whom it is intended. At one place it is stated that the sexual forms of simple tertian and quartan are difficult to distinguish in stained specimens from the full grown asexual forms; there should be no difficulty, as in the one case there is only one chromatin mass, in the other there are several.

Several excellent plates of the different parts of culex and anopheles are given, but the reproduction of stained films of malarial blood are not good and would be of little use to any one who had not already had considerable experience of the microscopical appearance of these parasites.

The author describes Leishman's method of using Romanowsky stain, but does not mention Leishman's name.

A photomicrograph of the surra parasite is given; it should have been mentioned in the text that this parasite is dividing, as the fact that this particular parasite possesses two macro- and two micro-nuclei, might give rise to confusion.

This is a most useful and comprehensive pamphlet, not only for those to whom it is specially addressed, but also to medical officers who already have a knowledge of the malaria parasite, but to whom possibly the mosquito is practically unknown.

D. HARVEY.

Current Literature.

Beri-beri and Sleeping Sickness in the Cameroons (*Die Post*, April 19, 1903).—In November of last year an article appeared in the German newspapers stating that a doctor in Sumatra had been making exhaustive observations regarding the influence exercised by the rice diet on the origin of beri-beri, and that he had come to the conclusion that it might really be the rice itself which caused the disease. The rice when allowed to stand, after boiling, absorbed germs which later on produced the infectious matter in the human body. By weighing out each time the proper quantity of rice, so that each meal consisted of a freshly prepared portion, the doctor was said to have succeeded in effectively checking the beri-beri disease.

With reference to these statements, Staff-Surg. Dr. Ziemann, Government Surgeon in the Cameroons, writes as follows: "Years ago I was already convinced that the beri-beri disease met with on the West African Coast was *not* a disease due to infection, but to intoxication, after the style of the pellagra disease prevalent in Italy. This latter illness, which chiefly affects the nervous system, is well known to be caused by the eating of bad maize. In an article on 'Sleeping Sickness,' *Centralblatt für Bakteriologie*, 1902, in which I traced the origin of sleeping sickness to the eating of cassava, I also stated the beri-beri disease to be a case of chronic intoxication (poisoning) through food, which, of course, could refer only to the diet of salt meat and rice. The more recent investigations made at Duala fully confirm the former experiences. I would therefore propose that the prison fare of rice and salt meat be now replaced by the customary diet of the country. Should this give good results it would then have to be considered whether the rice and salt meat diet given to the native Government *employées* could be systematically and gradually abolished, beginning, for example, with the police troops. My latest observations of the sleeping sickness of the Negroes, another case of which I now have under treatment in the hospital, only strengthens my conviction that the cause of this disease, which devastates Uganda, Angola, &c., quickly leading to a fatal result, is to be sought in the eating of raw, or badly prepared, cassava. The sleeping sickness is also well known to the Balundus, north-east of the Cameroon mountains, under the name of *Dipapagombe*, and is much feared by them; leprosy they know under the name of *Diauge*. At any rate, sleeping sickness is very frequent in the hinterland of the Cameroons. When the set of queries which I am preparing have furnished further material it may, nay, almost certainly will, become possible to check the spread of this disease by means of full instructions widely distributed over the hinterland.

[This note is inserted to show how easily scientific men may take up wrong theories, and how dogmatic they may be in stating them.—Ed.]

Precautions to Prevent the Introduction of Infectious and Contagious Diseases by the German Troops returning from China.—Owing to the length of the sea voyage, it was not considered necessary to quarantine men from ships in which there had been no cases of infectious or contagious disease during the voyage. Such men were sent direct to Munster in special trains, where arrangements were made for dealing with them, and without any communication with the civil population. In the case of ships in which cases of enteric and other infective diseases had developed during the voyage, all convalescents, sick and suspected cases, were detained at Bremerhaven in a specially constructed hutment hospital. On disembarkation the procedure was as follows. All baggage was taken out of the ship, conveyed to this temporary hospital and placed in the open. The men on arrival first handed in their arms and leather accoutrements at the formic aldehyde hut (F); they then went to the baggage heap and picked out their own property. This they carried to hut No. 17, where any Government property was handed in to the depôt officials and by them separated into two lots to be disinfected by steam or formaldehyde vapour. Private property was placed in bags or boxes and handed into tent No. 18. The men themselves then went to the ablution hut. Full baths were only provided for sick; suspects made use of shower baths. Ten men at a time were admitted into the undressing room, here they stripped and passed into the washing room. Under medical supervision they lathered themselves with soft soap and were hosed down with warm water. After drying they passed into another room and were provided with a complet outfit of hospital clothing. Money and valuables were placed in clean bags and taken with them through the washing room. Their soiled clothes were placed in bags, previously dipped into sublimate solution, and taken to the disinfecting chambers.

When the hospital was first opened a small steam disinfector was provided, this was soon found to be insufficient and a second larger one was added; later on, when the amount of disinfecting to be done had considerably increased, a separate water-tube boiler was supplied to generate steam for this apparatus. The formic aldehyde house was constructed later still when the large quantities of private property had to be dealt with.

Formic Aldehyde House.—This disinfecting hut measured 14 metres in length, nine in width, and $3\frac{1}{2}$ metres in height in the centre of the building, the side walls being $2\frac{1}{2}$ metres.

The floor was made of asphalt; the walls, covered externally with boarding, were constructed of cement tiles 5 c.m. in thickness, the joints being cememted; between these two a space $\frac{1}{10}$th metre in depth was left. The roof was constructed of papier maché (papp) lined with plaster tiles; the inner walls and ceiling were enamelled, the outer surfaces whitewashed.

The interior was divided into a central room surrounded by five side chambers. The disinfecting gases were developed in the central chamber by three Breslau machines. It was then conveyed in pipes to the side rooms, in which the materials to be disinfected were placed. Clothes were propped open by sticks and suspended so that the gas should come

in contact with every part of the material; smaller articles were placed in wide meshed nets; boxes were supported on light trestles. Before admitting the disinfecting gas the rooms were warmed by oil stoves.

Three grammes of formaldehyde gas were used for each cubic metre of room space and allowed to act for seven hours. Owing to the great increase in the quantity of material to be disinfected it was found necessary to shorten the time occupied by the process. This was effected by using five grammes of formic aldehdye for four hours. When the disinfection was completed ammonia was run in to deodorise the articles; half an hour later the doors and windows were opened, and about half an hour later still the things were ready to be removed.

Each man's things were placed on separate hooks, to the last article hung up a ticket was attached, showing the number of hooks which each man's property occupied; any boxes or other articles belonging to him had also the owner's name. The things were removed by the same attendant who had brought them.

C. E. Pollock.

The "Spotted Fever" of the Rocky Mountains.—This disease, which has been recognised clinically for some ten to twelve years as occurring in endemic form in certain narrowly defined limits of the States of Montana and Idaho, was found by Wilson and Chowning (First Biennial Report of the Montana State Board of Health, 1901-1902) to be associated with the occurrence of an intracorpuscular parasite in the red cells of patients suffering from spotted fever. This parasite, which closely resembled the *Piroplasma bigeminum*—the cause of the well-known Texas fever of cattle, has been named *Piroplasma hominis*. Wilson and Chowning described two forms of these parasites: (*a*) small ovoid non-amœboid forms measuring 1·5 μ to 2 μ in length by 1 μ in breadth; and (*b*) large forms, ovoid in shape, amœboid, and measuring 2 μ to 3 μ in length by 3 μ to 5 μ in breadth. These little parasites were found in small numbers —seldom more than 1 in every 500 red cells—in the peripheral blood, but occurred in large numbers in the blood of the liver, spleen and kidneys. Like the other Piroplasmata, they were unpigmented and consisted of colourless protoplasm. The results of staining by Romanowsky's method are not recorded. The double pyriform shape so characteristic of *Piroplasma bigeminum* is met with, but only rarely. Wilson and Chowning found the disease to be communicable to rabbits by inoculation of infected blood, and considered, as a result of their investigations, that infection of man took place through the bite of a "tick," as is known to occur in the case of Texas fever. These results have more recently been confirmed by Anderson (*Hyg. Laboratory, U.S. Public Health and Mar. Hosp. Service Bulletin*, No. 14, July, 1903). Anderson found these parasites in every case of "spotted fever," and failed to find them in healthy individuals or in those suffering from other diseases. He confirms the work of Wilson and Chowning as to the probable infection by means of ticks, and further identified the special tick as the *Dermacentor reticulatus*. He considers also that the parasite uses as an intermediary host a spermophile—a rodent allied to the squirrels

—as he found them in the blood of these animals. A suggestive point in connection with the mode in which ticks become infected is that he found the parasites in the blood of a child twenty-four days after convalescence and fourteen days after the child had begun to go about. From information collected by him it would appear that the disease is by no means confined to such a restricted area as was originally supposed, cases having been met with in Nevada, Wyoming and Eastern Oregon. In view of the grave mortality of the disease—70 to 80 per cent.—it is interesting to learn that five cases treated with large doses of quinine recovered. Further investigations on this most interesting disease and the *rôle* played by ticks in transmitting it are much to be desired, and will doubtless be recorded before long.

W. B. LEISHMAN.

Outbreaks of Enteric Fever due to Infected Dust.—Some interesting notes have been selected by Visbecq in the *Arch. and Med. et Pharm. Mil.*, June, 1903, bearing upon the influence of local surroundings in the causation of enteric fever. At Amiens in 1892 a smart explosion of enteric occurred in the 8th Battalion Chasseurs-à-pied from May to August. As a causative agent the water supply could be excluded. The citadel in which the barracks were located is overlooked on the west by a hill some 100 metres off. Upon the hill was deposited a heap of road sweepings, house refuse and manure. Nos. 1 and 2 Companies, occupying the western side of the barracks exposed to the prevailing wind, which blew from the hill, gave the great majority of cases. The other companies were scarcely affected.

In the same garrison, during February and March, 1897, the 124th Regiment, occupying the Schneider and Corbincan barracks, suffered severely. No reason existed for attaching suspicion to the water. The Schneider were the newer and better laid out barracks, but all the cases of enteric fever arose in it. About 450 metres from this barrack was an open shed in which human manure, taken from the town where enteric was more or less prevalent, was dried, sifted and then scattered over certain cultivated fields which reached up to the barrack walls. In February the prevailing wind was violent and blew directly from the shed over these fields to the barracks. On vacating these quarters in March, the epidemic ceased at once.

At Luneville the 8th Regiment of Dragoons suffered much from enteric fever during the latter half of 1895. The water was irreproachable. Certain large trenches were dug close to the barracks and the first cases appeared in the part of the building nearest to these works. The earth taken from the trenches was used in the making of a new *manège*, and all the later cases occurred exclusively in a part of the barracks closely adjacent to the newly-formed embankments of this riding school.

At Tunis an epidemic of enteric fever broke out among the civil population during 1897. In consequence of this the 4th Chasseurs d'Afrique were moved out into camp. When the epidemic had abated they returned to barracks, but owing to some sickness among their horses were compelled to encamp on the parade ground. This ground

adjoined a vineyard freely manured with human excreta. A severe outbreak of enteric broke out amongst the men of the regiment. By degrees the men were moved into barracks, but the disease steadily prevailed among each squadron so long as it remained in the camp. Examinations of numerous samples of dust gathered from the leaves of adjacent trees showed marked bacterial evidence of fæcal material.

These instances from French sources are very interesting in view of the opinions long held among British army surgeons that by focussing our attention too closely upon water-borne enteric fever, we are apt to overlook aerial and other possible sources of infection.

J. FALLON.

The Treatment of Tropical Ulcers.—This subject is discussed by Surg.-Major Dr. P. Daireaux in *Le Caducée,* November 27, 1903. After alluding to the frequency of these ulcers and the various appearances they present, for purposes of treatment he classifies them as benign and pseudo-membranous. In the former, the ulcers are either round or oval; the surface is yellowish and pulpy. On scraping off the superficial layer, which is closely adherent, the exposed ulcer is of a pale rose colour; at the borders the skin is slightly separated, the ulcer burrowing under it. Antiseptics and caustics do not arrest the progress, and may even do harm; the ulcer may take months to heal under hot water dressing recommended recently at the Dermatological Society.

In subjects weakened by malaria, or other causes, these mild ulcerations often become much more serious. They may resemble the form common at one time in hospitals, becoming either pulpy or pseudomembranous with advancing ulceration. In the first case, the sore is covered with a yellowish layer, resembling pigskin, closely adherent and spreading superficially and deeply by molecular necrosis. In the other form, the ulcer burrows under the skin in large channels full of fœtid pus and exposing the deeper parts. All these ulcers are caused by fusiform bacilli, which are also the cause of hospital phagedena. They are similar to diphtheria of wounds.

During his stay in Tonquin Dr. Daireaux has treated all cases of these ulcers by Salleron's method, with complete success. After exposing the burrows and thoroughly cleansing the surface, he applied a layer of absorbent cotton-wool or lint, impregnated with the officinal solution of perchloride of iron. This is allowed to remain for twelve hours; after its removal the surface appears blackish and dry, owing to the caustic action of the solution. The blackness soon gives place to a simple healthy ulcer, which heals more or less rapidly. In a case of which the details are given, the ulceration had spread from one malleolus to the other behind the ankle. The application of the iron solution was preceded by that of the actual cautery, heated to a dull red. The ulcer healed in fifteen days. In two other cases the ulcers appeared at spots where quinine had been injected. For simple ulcers it is sufficient to apply the solution for a quarter of an hour every other day, using hot water dressings in the intervals. The perchloride does not act simply as a caustic; the same good result cannot be obtained from chloride of zinc. We know that tartrate of iron is very useful in venereal phagedena;

preparations of iron would seem to exert a special action upon necrosis as a complication of wounds.

T. P. SMITH.

The Significance of Persistent Perforations of the Tympanic Membrane as regards fitness for Military Duty.—In a paper read before the German Society of Medicine in September last, Staff-Surg. Paubert (*Deutsche Militärärztliche Zeitschrift*, December, 1903) emphasised the danger of these perforations, from access of air and water, especially where middle ear disease has been, or still is, present. The most important element in aiding a decision is the condition of the tympanic mucous membrane and the presence of effects of the inflammatory process. In the absence of such remains, and provided that the tympanic mucous membrane be covered with epidermis and the nose be healthy, the man may be accepted. Some otologists maintain that large perforations and any openings near Shrapnell's membrane should involve rejection. But among many patients even when the tympanic and nasal mucous membrane are not in the condition above described, some will be found in whom a cure should be attempted. When ordinary measures have failed, it is desirable that the aid of skilled otologists should be sought in chronic cases. The question of length of treatment in the case of soldiers, before deciding on their discharge, is a very important one. In the discussion that followed, Surg.-Gen. Villaret suggested that the medical officers of schools should seek to discover all cases of ear disease among the children, and bring them to the knowledge of the parents.

T. P. SMITH.

Military Cookery in the Norwegian Army. — In *Le Caducée*, December 5, 1903, Surg.-Major Reichborn-Kjennerud describes the improvements that have been made in cookery for the Norwegian Army since 1900. Before that time there were no regular military cooks and the superintendent, a sub-quartermaster, had no special knowledge of the art of cooking. The food was prepared by soldiers, who took turns of duty for one or two days, having no knowledge of the culinary art. Much of the food was often rejected by the men, who, when able, purchased viands from those who supplied them. In 1900 a great change was made. Soldiers were specially selected to act as cooks, those being chosen who were less fitted than their comrades for purely military duties, but who had previously been engaged as cooks in hotels or on board ship, or as bakers or butchers. The cooking was done in each company; the food having first been made over to the quartermaster who was responsible for its preparation, with a subordinate chief cook. The men selected for the work had only a rudimentary military training. The quartermaster and his subordinates received instruction in cookery and in various details connected with articles of food. Manuals of instruction have been provided, dealing with cookery on active service as well as in barracks. A great improvement has already been noticed in the bread supplied to the troops, with obvious benefit to the general health. Economy has also been effected, and less money is spent the canteens.

T. P. SMITH.

In the *Gazzetta Medica Italiana* (December, 1903) there are notes on "Banti's disease"—an obscure and hitherto unexplained form of idiopathic chronic enlargement of the spleen with hepatic cirrhosis unconnected with malaria, syphilis or alcoholism. It is not noted whether Leishman's bodies were found on splenic puncture.

And also on "The nasal cure of genital weakness in man and of dysmenorrhœa in woman," due to the sympathetic relations of the nasal pituitary mucous membrane with the genital organ (ovary or testicle); the treatment was carried out by electrical stimulation of the pituitary mucous membrane, and the results are stated to have been excellent and to have fully come up to expectation.

In *Il Morgagni* (December, 1903) suggestions are given for the prophylactic treatment of diphtheria on a case occurring in a regiment, which consists briefly in the immediate administration of a hypodermic injection of anti-diphtheritic serum to all the soldiers who shared the same barrack room with the patient, and also to all those who had been brought into contact with him, and if the succeeding cases appear to be confined to one particular unit, the treatment should be extended to all the men of that unit.

In the same paper the results of about 400 cases of extirpation of the spleen would tend to show that no essential disturbance of the system was caused thereby with the exception of a slight but transient leucocytosis soon after the operation, the splenic functions being readily carried out vicariously by the other organs; how this is done is not at present understood, as neither the lymphatic nor the thyroid glands become enlarged after splenectomy, neither does the bone marrow present any alteration in appearance, but possibly the great omentum may assist in restoring the normality of the blood.

In the *Giornale Medico del Ro Esercito* (November 30, 1903) Surg.-Lieuts. Pennetta and Palmieri write a paper on "Diazo-reaction in fever cases." These gentlemen not only tested the urine of every soldier admitted to hospital at Bari with a high bodily temperature, but also supplemented their experience by outside practice on civilians, making in all a total of 252 examinations of various diseases (including enteric fever, the exanthemata, erysipelas, influenza, pulmonary complaints, cerebrospinal meningitis, &c.). The conclusions that they arrived at were as follows: (1) That a positive diazo-reaction is constant in enteric fever, but is the exception in other diseases; (2) that this reaction always occurs in enteric fever within a week of its onset, generally between the third and seventh day, but in other diseases it appears earlier; (3) that in enteric fever it generally but not invariably disappears with the fall of temperature, but in other diseases there is no relation between the reaction and the course of the illness; (4) that in enteric cases the intensity of the reaction bears no direct relation to the gravity of the disease; (5) that during convalescence from enteric fever, if there is a return of high temperature a *positive* reaction indicates a relapse, whilst a *negative* one warns us that the complication is of a non-typhoid character.

In the same journal Surg.-Col. Imbriaco has a lengthy paper on "Surgical aid on the battle-field and at the dressing stations in modern warfare," which is worthy of a fuller description than is given here. The writer correctly states that the task of an Army Medical Service in modern warfare has been rendered more delicate, more complex and more difficult by reason of the progress made in the arts of medicine and of war, by the changed conditions of modern tactics, and also by the greater requirements of our civilisation.

He propounds these two questions: (1) What are the imperative rules for the first aid to the wounded, due regard being had to the nature and characters of the lesions caused by those fire-arms now in use and also to the requirements of modern surgery? (2) How, where, and when can the first treatment and aid be applied, or, in other words, what can and must be the special duties of the first lines of medical aid, *i.e.*, at the collecting and dressing stations, and advanced field hospitals? He next describes the reform in the treatment of gunshot wounds, beginning with the Franco-German War of 1870-71, and arrives at this conclusion, "the microbes introduced by means of the bullet into rifle gunshot wounds generally remain inactive, and the wound behaves as if it were germless, unless special circumstances—including an improper and ill-adapted dressing—favour the development of the bacteria still living in the depths of the tissues." He next discusses at length the relative merits of *asepsis* and *antisepsis*, and also the various kinds of first field-dressings, which latter should satisfy two essential conditions, viz., absorption and evaporation, and he lays down as the basis of the up-to-date treatment of the wounded in war that gun-shot "wounds, even if not aseptic, may practically be considered as non-polluted ones, and the first field-dressing should preferably be an antiseptic one, but, and this is essential, it should be one free from germs in an active state; the dressing should be simply an occlusive and absorbent one, capable of thoroughly protecting the wound and of encouraging drainage therefrom, and no antiseptic or other energetic means of treatment should be employed which might injure the vitality of the tissues." He next shows how and with what results the above-mentioned conditions were carried out in the more recent wars, with special reference to the Anglo-Boer war; he further advocates the formation of special hospitals in the immediate vicinity of the battle-field for the treatment of those wounded in the abdomen or large cavities of the body, these hospitals to be under the care of a skilled specialist in this branch of surgery, and the wounded should be taken there direct without going through the usual intermediate stages of the collecting and dressing stations.

In the *Annali de Medicina Navale* (October, 1903) Dr. Guerra describes some anti-malarial experiments undertaken in the Naval Hospital at Taranto by special official sanction from the higher authorities between the middle of July and the latter end of September, this period being the one in which occur the greatest number of cases of severe æstivo-autumnal fever. The prophylactic treatment consisted in the daily administration of 4½ grains of quinine at stated hours, with special

reference to the times during which the troops would be exposed to mosquito-bites. For this purpose 146 men, selected as being immune to malaria, were taken from the two main detachments of the Garrison, and as a check against possible error 311 men were used as a control experiment. The results were practically negative, the percentage of admissions to hospital being as follows: of those who underwent the prophylactic cure 5·48 per cent., of those kept as a control 5·14 per cent.; moreover, the prophylactic treatment in no way modified or relieved the usual course of the fever, although no difference whatever in treatment was made in either class of cases.

In the same journal Dr. Dante, in a paper "On the so-called 'Climatic Bubo,'" tries to prove that this disease is only a modified form of plague. When describing the cases he states that he carefully excluded their possible connection with malaria, filariasis, or venereal diseases But looking to the fact that the ship (on which the five cases diagnosed occurred) had but recently left Naples, which was at that time an infected port, and this after a fairly prolonged stay, and that for some days before leaving it the fact had been noted that dead rats were floating in the harbour from which the water was taken to wash down the decks, &c., and that there had also been contact with the shore (from the fact that provisions had been brought on board), it would appear to us not only that the diagnosis of *pestis minor* was probably correct in this particular instance, but also that the facts do not otherwise justify the exclusion of climatic bubo from the list of tropical diseases.

In the same journal Dr. Castellani describes several cases of bilharzia occurring in Uganda, and his deductions may be summed up as follows: The geographical distribution of bilharzia hæmatobia is of much wider range than is generally supposed; cases of proctitis caused by bilharzia may give rise to symptoms of dysentery; bilharzia hæmatobia may sometimes be present in the human body for some considerable time without giving rise to any symptoms of disease; the blood of individuals suffering from bilharziasis, as in other forms of helminthiasis, presents a certain amount of eosinophilia.

In the same journal Dr. di Jiura describes the British Colony of Wei-hai-wei, and considers it a first-rate station as regards climate; he states that although the British Naval Station at Liu-Quang-tao cannot certainly be called a model one, it is well organised in most respects. The Wei-hai-wei Regimental Hospital at Port Edward had certain defects, notably that the sick were overcrowded into four wards, although there were other rooms lying empty. This same gentleman, in his description of the German Colony of Kiau-chau says of the Military Hospital, "truly this hospital is a very fine one and shows that the Germans do things well and especially without any niggardly parsimony." The hospital is equipped for 200 beds and appears to be fitted up with all the latest improvements. As the percentage of venereal diseases is a very high one, all soldiers returning off pass are sent to hospital to

undergo a mild course of disinfection, but even in spite of these precautions there are still many admissions for both gonorrhœa and syphilis, but otherwise the general health of the troops is good.

Revista de Sanidad Militar (December, 1903). This journal contains an Army Circular, dated November 11, to the effect that spittoons are now to be supplied to and taken on charge in all barracks and other military buildings not only throughout the Peninsula, but also in the adjacent Islands and African dependencies, the numbers required to be determined by District Boards and in accordance with local requirements. It also makes some remarks on "sleeping sickness" (taken from a French source) and on "Flies and Typhoid Fever" (from a German source); in the latter it is stated that although it is generally admitted that enteric fever may be spread by means of flies, this possibility has not yet been proved, neither by careful and exhaustive epidemiological observation nor by experimental investigations which comply with modern scientific requirements. Experiments in this direction by Ficker are now quoted and, admitting the possibility of the infection of enteric fever and of other diseases being transmitted by flies, it acknowledges that the study of the most appropriate means for their destruction has now reached the stage of being considered as an interesting hygienic problem.

La Medicina Practica (December, 1903). This contains a continuation of two papers contributed in serial form by Spanish Army Surgeons, viz., Dr. Otero's paper on "Large hepatic abscesses and their surgical treatment by Fontan's method" (*i.e.*, scraping of the cavity by Volkman's spoon), and Dr. Dominguez's memoir on "The prophylactic action of the salts of quinine and the general prophylaxis against paludal infection to be undertaken by Europeans in Fernando Po."

This latter gentleman describes a daily routine of life which should be followed by all residents and more especially by the troops, both Naval and Military, stationed there. His advice is, "On the stroke of *reveillé* everyone should bathe, finishing up the bath with a cold douche; immediately afterwards a cup of hot coffee should be taken, with three grains of some salt of quinine—either the hydrochlorate or the bi-sulphate—in a wafer, and a small glass of spirits; active duties or practical exercises can now be undertaken until 10 or 11 a.m., taking care that the awnings are first put up on board ship or that those places are roofed over where the troops are undergoing instruction; from 12 noon to 3 p.m. should be a period of rest, which should be spent not in sleep but in theoretical exercises, or in reading or writing; at 3 p.m. a glass of lemonade, or better still of fresh beer, but not iced; from 3.30 to 4.30 p.m. practical exercises again; from 5 to 6 p.m. games or walking exercise; 6 to 7 p.m. dinner; 7 to 8 p.m. rest; 8 p.m. bed; and so from day to day." He now describes the several articles of clothing, which should be loose-fitting and comfortable, but he would entirely stop the use of flannel, its place being taken by cotton-print shirts, with light clothing suitable to the well-marked changes of tropical temperature. [The several objections that he offers to flannel are probably due to a coarse and otherwise unsuitable make.—J. E. N.]. All kinds of sun-shade umbrellas should be suppressed, a suitable head-dress answering all purposes. Iced drinks are strongly condemned.

Sleeping apartments should be kept closed during the heat of the day, and at sunset insecticides, *e.g.*, zanzoline, should be burnt in them so as to stupify or kill the mosquitoes; mosquito nets should be used.

J. E. NICHOLSON.

The Sanitary Value of the Creolins.—It is satisfactory to note that a critical spirit is prevailing in regard to some common disinfectants. This is specially so in respect of the group known commercially as creolin; a term applied to any emulsion of cresols and neutral tar oils in a soap solution. A suggestive paper on this subject appears in *Public Health*, December, 1903, by Dr. S. Rideal, in which the author not only reviews the chemical composition of these preparations, but draws attention to the great difference which exists between the disinfectant value of the cresols according to their chemical and physical conditions. Thus, a disinfectant containing 10 per cent. of tri-cresol in emulsion is equivalent in bactericidal efficiency to one containing 30 per cent. in solution when tested against a standard culture of *B. typhosus*. An attempt to meet the difficulty has been made in Germany, partly by the manufacturers who distinguish between creolins marked "phenolfrei" and those marked "phenolhaltig," and partly by the Pharmacopœia, which has an official preparation, a mixture of cresols and soft soap in definite proportions. Rideal's chemical estimations of a number of commercial creolins, drawn from a variety of sources, indicate that neither the volume of the tar acids nor their bromine equivalents are of any value in judging of the relative efficiencies of emulsions containing tar oils. Thus, in a certain English sample, known as "cyllin," the oil which separates out on acidification is insoluble in water and, therefore, is neither carbolic acid nor a mixture of cresylic acids. The German terms "phenolfrei" and "phenolhaltig" do not, therefore, explain their differences, and we are forced to conclude that the English creolin (cyllin) is different in its chemical constitution to the creolin sold on the Continent. Much the same results appear if we consider the various creolins in the light of their bactericidal efficiencies. By reducing them to terms of a carbolic acid co-efficient, as against a standard bacterial culture, it was found that while a German "phenolfrei" creolin has a co-efficient but little over 1·5, and a "phenolhaltig" sample one of 3·6, the English creolin (disinfectant) has a co-efficient of 11 and the preparation called cyllin a carbolic acid co-efficient of as much as 16. Some experiments which we have made ourselves, on the relative values of commercial disinfectants, give very similar figures, and we deem it desirable that all medical officers should value these emulsions in terms of carbolic acid equivalents, as expressive of their bactericidal efficiency, rather than on mere chemical characteristics of either phenol or the cresylic acids.

R. H. FIRTH.

Corps News.

Royal Army Medical Corps.

Lieut.-Col. J. Hickman retires on retired pay, dated January 20, 1904. He entered the Service in 1882; was promoted Surg.-Major in 1894, and Lieut.-Col. in 1902. His war services are as follows:—Burmese Expedition, 1886—medal with clasp; expedition to the Gambia, 1892; attack on Toniataba, March 13; capture of Toniataba—medal with clasp; Ashanti Expedition, 1895-6—star; operations in Sierra Leone, 1898-9—clasp; South African War, 1899-1900—Queen's medal with two clasps.

Capt. J. M. Buist, from the Seconded List, to be Capt., dated December 1, 1903.

Lieut. O. Challis, from temporary half-pay, to be Lieut., dated December 24, 1903.

Lieut. O. Challis to be Capt., dated December 24, 1903.

Lieut.-Col. T. Archer, M.D., retires on retired pay, dated February 6, 1904. He entered the Service in 1881, was promoted Surg.-Major in 1893, and Lieut.-Col. in 1901. His war services are as follows: Nile Expedition, 1898—Egyptian medal. Medal, South African War, 1899-1902; operations in the Transvaal; operations in Orange River Colony; operations in Cape Colony, south of Orange River—King's medal with two clasps.

The undermentioned Capts. to be Majors, dated January 30, 1904:—

H. D. Mason, E. M. Pilcher, M.B., D.S.O., H. P. Johnson, W. G. Beyts, H. A. Stalkartt, M.B., H. N. Dunn, M.B., S. H. Withers, M.B., E. M. Morphew, E. C. Anderson, D.S.O., N. Tyacke, L. A. Mitchell, M.B., C. C. Fleming, M.B., D.S.O., J. Hennessey, M.B., C. B. Martin, M.B., G. J. Buchanan, M.B., C. B. Lawson, M.B., J. F. M. Kelly, M.B., G. S. Crawford, J. D. Alexander, M.B.

Lieut. R. McK. Skinner to be Capt., dated January 2, 1904.

Capt. R. M. Le H. Cooper, M.D., retires on a gratuity, dated February 13, 1904. He entered the Service in 1896, and was promoted Capt. in 1899. His war services are as follows: South African War, 1901-2; Operations in Orange River Colony, including actions at Biddulphsberg and Wittebergen; operations in Cape Colony, south of Orange River—King's medal with two clasps.

The undermentioned gentlemen to be Lieuts. on probation, dated January 30, 1904:—

Godfrey Faussett Rugg, Douglas Stokes Brownlie Thomson, M.B., Arthur Samuel Arthur, M.B., John Fairbairn, M.B., Robert Grenville Anderson, Leonard Bousfield, M.B., James Henry Douglass, M.D., Dumaresq Le Bas, Robert Robinson Lewis, Charles Harold Turner, Frank Herbert Noke, George Elliott Cathcart, Eugene Christopher Whitehead, M.B., Travis Clay Lucas, John Archbold Turnbull, William Wiley, M.B., Richard Brassey Hole, M.B., Alexander Loftus Otway, M.B., Walter Frederick Hamilton Vaughan, Montague Frederick Grant, Howard Harding, M.B., David Patrick Johnstone, Edward Henry Milner Moore, Frederick Joseph Garland, M.B., Michael David Ahern, Harry Bertram Connell, George Sullivan Clifford Hayes, Sidney Clement Bowles, Alban Anderson Meaden, Robert John Cahill, M.B.

The undermentioned Lieuts. are seconded under the provisions of Article 349 of the Pay Warrant:—

R. G. Anderson, dated January 30, 1904; S. C. Bowles, dated January 30, 1904; F. H. Noke, dated January 30, 1904.

Scots' Guards.

Surg.-Major W. C. Beevor, M.B., C.M.G., from the Seconded List, to be Surg.-Major, dated January 14, 1904.

Army Medical Reserve of Officers.

Surg.-Major G. H. Darwin, M.D., having resigned his Volunteer appointment, ceases to belong to the Army Medical Reserve of Officers.

Surg.-Capt. W. P. Peake, having resigned his Volunteer appointment, ceases to belong to the Army Medical Reserve of Officers.

ROYAL MALTA ARTILLERY.

Surg.-Lieut. R. Vella, M.D., to be Surg.-Capt., dated January 2, 1904.

EMBARKATIONS.—S. Africa: Major J. H. Greenway. India: Lieut.-Cols. D. O'Sullivan, J. L. Hall and A. S. Rose; Majors R. Caldwell, F. A. Newland, J. C. Morgan, C. H. Hale and A. P. Blenkinsop; Capts. F. A. Simons, C. D. Myles, J. Grech and L. P. More; Lieuts. G. H. J. Brown, D. L. Harding, A. T. Stack, H. J. Crossley, D. G. Carmichael, D. Ahern, W. B. Taylor, B. H. V. Dunbar, W. Tyndale, H. B. Kelly, J. C. G. Carmichael-R. H. Bridges, J. G. Bell, A. J. Hull, T. E. Harty, J. S. Coates, C. Bram, hall, E. M. Pennefather, J. A. W. Webster, H. H. Swanzy and R. C. Wilmot.

POSTINGS.—Lt.-Col. C. R. Woods to Cork.

Lieut.-Col. J. M. Jones to Devonport.

Majors H. Cocks, H. St. G. Hore, B. J. Inniss, J. S. Green and C. A. Young; Capts. R. J. Blackham and E. W. Powell to Ireland.

Major J. Maher to Jersey.

Majors S. Macdonald and B. A. Maturin to Woolwich.

Capt. H. Hewetson to Aldershot.

Lieut.-Col. H. K. Allport to Thames District.

Lieut.-Col. W. B. Thomson to Portsmouth.

Major J. Girvin to Home District.

Lieut.-Col. W. D. A. Cowen to Alderney.

Lieut. A. C. H. Gray has proceeded to Uganda to assist in the investigations into sleeping sickness.

Lieut.-Col. W. B. Thomson has been appointed to the charge of the Military Families' Hospital at Portsmouth, in succession to Major J. Will, who has received the appointment, under the Foreign Office, of Principal Medical Officer in the East Africa and Uganda protectorates.

Major E. C. Freeman has been appointed Sanitary Officer in the Eastern District, and Major R. W. H. Jackson in the Cork District.

Capt. C. G. Spencer has been appointed Specialist in Operative Surgery at Curragh, and Capt. D. J. Collins as Specialist in Ophthalmology at Dublin.

Lieut. A. B. Smallman, R.A.M.C., has been struck off ordinary duty in order that he may assist in the investigation of methods of prophylaxis in enteric fever, and especially of anti-typhoid inoculation.

Capt. C. E. Pollock, R.A.M.C., has started on a six months' tour through the principal European hospitals to study the most recent methods of treatment of venereal diseases.

LONDON COMPANIES, R.A.M.C. (Vols.).—Major Gibbard, R.A.M.C., writes: "The annual distribution of prizes took place on Feb. 6, the prizes being given away by the Countess Howe, who on her arrival was received by a Guard of Honour (under the command of Capt. J. Harper). Amongst those present were: Sir William Church, K.C.B., President of the Royal College of Physicians; Surg.-Gen. Evatt, C.B., Col. A. T. Sloggett, C.M.G., P.M.O., Home District; Lieut.-Col. E. M. Wilson, C.B., C.M.G., D.S.O., and Major T. McCulloch, R.A.M.C., D.A.D.G., A.M.S.

"After the presentation of prizes, the Countess Howe unveiled a Memorial Tablet recording the names of eighty-six officers, N.C.O.'s, and men of the Corps who served in South Africa during the war, the buglers sounding the Corps call, followed by the 'advance' as the curtain of flags was withdrawn.

"Lady Howe made a most gracious speech, in which she spoke highly of the work done by the R.A.M.C. Volunteers, who served in the Imperial Yeomanry Hospitals and Bearer Company in South Africa."

ROYAL ARMY MEDICAL COLLEGE.—The following Capts. passed the examination for promotion to Major on the termination of the course, January 31, 1904, and have been distributed to Stations:—

J. H. Rivers (6) (sp. Skiagraphy), F. R. Buswell (3), F. A. Symons (3), C. G. Spencer (6) (sp. Operative Surgery, advanced), T. H. Goodwin (6) (sp. Skiagraphy), D. J. Collins (6) (sp. Ophthalmology), J. B. Anderson (6) (sp. Bacteriology), A. E. Master (3) (sp. Laryngology), G. Dansey Browning (3),

E. S. Clark (3) (sp. Specific Fevers), K. M. Cameron (3) (sp. Operative Surgery, advanced), P. Evans (6) (sp. Specific Fevers), A. E. Milner (3) (sp. Skiagraphy), C. K. Morgan (6) (sp. Skiagraphy), J. P. Silver, J. M. Buist (6) (sp. Bacteriology), H. A. L. Howell (6) (sp. Specific Fevers), D. Lawson (3), E. B. Steel (3) (sp. Psychological Medicine), H. E. Staddon (3), S. J. C. P. Perry (3) (sp. Skiagraphy), C. F. Wanhill (6) (sp. Bacteriology), L. Addams-Williams (3), M. Mac G. Rattray (3), J. G. Berne (3), (sp. Laryngology), J. S. Gallie (3), F. J. C. Hefferman (3).

Note.—Percentages of aggregate marks were obtained, rendering officers eligible for six months' acceleration in promotion by those whose names are marked thus: (6). For three months' acceleration by those marked thus: (3).

The officers who specialised in their special subject are indicated thus: (sp.) and the subject.

The following have joined the College for a course of instruction, commencing February 1, 1904:—

Capts. W. S. Harrison, L. F. Smith, S. H. Fairrie, G. T. K. Maurice, J. V. Forrest, H. W. Grattan, J. H. Campbell, D.S.O., E. W. Bliss, J. C. B. Statham, E. C. Hayes, A. H. Waring, E. W. W. Cochrane, A. H. Morris, G. B. Riddick, A. J. MacDougall, R. W. Clements, M. Swabey, W. E. Hudleston, T. H. M. Clarke, C.M.G., D.S.O., E. W. P. V. Marriott, C. H. Hopkins, E. A. Bourke, A. C. Lupton.

The Entrance Examination concluded on January 30, and the successful candidates, whose names follow, have joined the College for the junior course:

Lieutenants (on probation): G. F. Rugg, D. S. B. Thomson, M.B., B.Ch. Dub.; A. S. Arthur, M.B., B.S.Durham; J. Fairbairn, M.B., B.Ch.Edin.; H. G. Anderson (seconded); L. Bousfield, M.B., B.Ch.Cantab.; J. H. Douglass, M.B., B.Ch., D.P.H.Dub.; D. Le Bas, R. R. Lewis, C. H. Turner, F. H. Noke, M.B., B.S.Lond. (seconded); G. E. Cathcart, E. C. Whitehead, M.B. Lond.; T. C. Lucas, J. A. Turnbull, W. Wiley, M.B., B.Ch.Dub.; R. B. Hole, M.B., B.Ch.Edin.; A. L. Otway, M.B., B.Ch.Dub.; W. F. H. Vaughan, M. F. Grant, H. Harding, M.B., B.Ch.Edin; D. P. Johnstone, E. H. Milner Moore, F. J. Garland, M.B., B.Ch.Dub.; M. D. Ahern, H. B. Connell, G. S. C. Hayes, S. C. Bowle (seconded); A. A. Meadon, R. J. Cahill, M.B., B.Ch., R.U.I.

Also Lieutenants (on probation) of the Indian Medical Service: H. B. Drake, E. C. Hodgson, W. S. McGillivray, W. Gillitt, W. F. Brayne, M. S. Irani, S. W. Jones, W. Tarr, C. H. Barber, W. T. McCowan, I. D. Jones, H. Watts, J. Anderson, W. T. Finlayson, H. G. Stanger Leathes, E. A. Roberts, G. G. Hirst, M. J. Quirke, J. M. Holmes, M. F. White.

NOTES FROM THE NORTH WESTERN DISTRICT.—No. 10247 Lce.-Sergt. A. Speddings, died of V.D.H., at Preston, on February 4.

NOTES FROM THE WESTERN DISTRICT.—Capt. F. Kiddle writes: "At a meeting held in the Officers' Library Station Hospital, Devonport, on Dec. 21, 1903; the P.M.O.W.D. in the Chair:—

"(1) It was decided that a Medical Society be formed, the members of which being officers of the R.A.M.C. and medical practitioners in charge of troops, &c., serving in the Western District.

"(2) Meetings are to be held at 5.30 p.m., on the third Friday in each month, at the Officers' Library, when members will read papers, show cases, &c., and have discussions thereon.

"(3) Members at out-stations are invited to forward papers to these meetings; they will be read and discussed and afterwards returned to the writer, with any comments that may be made.

"(4) All papers are to be on professional subjects only, and should be forwarded some days before a meeting, in order that arrangements may be made to have them read.

"(5) There is no subscription, but members are asked to pay an entrance donation of 1s., to defray any small expenses—*e.g.*, postage, &c."

ARRIVALS HOME. From Egypt: Lieut.-Col. C. R. Woods. From Cyprus: Major J. Girvin. From West Coast of Africa: Capt. P. S. Lelean. From India: Lieut.-Cols. J. M. Jones, W. D. Cowen, C. Seymour, W. Keays and

W. B. Thomson; Majors J. Maher, H. St. G. Hore, H. Cocks, B. Forde, B. J. Inniss, J. S. Green, C. A. Young and B. A. Maturin; Capts. A. J. MacDougall, C. H. Hopkins, E. W. P. V. Marriott, E. W. W. Cochrane, A. H. Morris, W. E. Hudleston, and R. J. Blackham. On leave: Lieut.-Cols. E. Butt and C. B. Hill, Capts. J. F. M. Kelly, W. J. P. Adye-Curran, and J. C. Kennedy.

The first meeting of the newly-formed Medical Society of the R.A.M.C. in the Western District was held at the Station Hospital, Devonport, on Jan. 15. Colonel Bourke, R.A.M.C., P.M.O., in the Chair, and twelve members were present.

Major Tatham, R.A.M.C., read a paper on "The Advantages, or otherwise, of Wright's Preventive Inoculation for Enteric."

Major C. H. Hale, D.S.O., R.A.M.C., exhibited a pair of Lynn-Thomas's forceps for use in amputation at the hip-joint. It is claimed for these that they reduce the loss of blood in this operation to a minimum.

Devonport. F. KIDDLE, Capt. R.A.M.C.
January 24, 1904. *Hon. Sec.*

NOTES FROM AGRA.—Lieut.-Col. Franklin writes: "Sir Frederick Treves, who is touring in India, was entertained at a complimentary dinner on New Year's Day at the Agra Club. The hosts included Lieut.-Col. D. F. Franklin, Major Adams and Capt. Cuthbert, R.A.M.C., Major Henderson, Major Drake-Brockman and Capt. Birdwood, I.M.S., Professor Hankin and Dr. Waters, of Tundla.

"The guests present to meet Sir Frederick were Lieut.-Gen. Sir Alfred Gasdee, G.C.I.E., K.C.B., commanding the Forces, Bengal."

NOTES FROM MEERUT.—Lieut. F. A. H. Clarke writes: "A sad accident occurred at Rawal Pindi on January 9. Capt. Jephson, R.A.M.C., went out shooting with his two dogs in the early morning. Later in the day he was found in the park shot through the head, and his gun lying near him. He died before he could be taken to the hospital. The deceased officer was a stranger in Rawal Pindi, and had arrived on the previous day, having marched up with a battery of artillery from Umballa." (From *Pioneer*, Wednesday, January 13, 1904.

Lieut. M. F. Foulds, R.A.M.C., attached to Jhansi Station Hospital, is transferred to Jubbulpore, for duty in the Nerbudda District.

Col. W. E. Saunders, C.B., R.A.M.C., has taken over the administrative medical charge of Meerut and Bundelkhand Districts from Lieut.-Col. A. W. P. Inman, R.A.M.C.

Lieut. M. C. Beatty, R.A.M.C., is transferred from the Poona to the Mhow District.

An exchange of places on the roster of the Indian Service has been sanctioned between Lieut.-Cols. T. F. McNeece and W. G. Birrell, R.A.M.C.

Stations of officers R.A.M.C. who have come to India this trooping season, up to date of publication of India Army List, January 1, 1904:—

Lieut.-Col.	*Station.*	*Lieutenants.*	*Station.*
F. H. Treherne	.. Nowshera, C.S.H.*	H. G. Pinches ..	.. Lucknow.
Majors.		J. V. Roche ..	.. Fyzabad.
J. J. C. Donnet	.. Colaba, C.S.H.	M. C. Beatty ..	.. Poona.
G. E. Hale, D.S.O.	.. Kirkee, C.S.H.	P. Davidson, D.S.O.	.. Rawal Pindi.
E. Davis ..	.. Amritsar, C.S.H.	A. H. Hayes ..	.. Peshawar.
H. Carr ..	.. Poona.	R. B. Ainsworth	.. Secunderabad.
T. G. Lavie ..	.. Bangalore.	C. A. J. A. Balck	.. Umballa.
G. F. H. Marks	.. Sitapur, C.S.H.	R. L. V. Foster	.. Mian Mir.
G. Raymond	.. Belgaum.	F. A. H. Clarke	.. Meerut.
W. T. Mould	.. Fatehgarh, C.S.H.	G. A. K. H. Reed	.. Agra.
— Philson ..	.. Roorkee, C.S.H.	G. W. Smith ..	.. Jubbulpore.
Captains.		J. M. H. Conway	.. Umballa.
W. Tibbits ..	.. Calcutta.	S. N. W. Meadows	.. Mian Mir.

* Commanding Stan. Hosp.

Captains.	*Station.*	*Lieutenants.*	*Station.*
A. W. Hooper, D.S.O. ..	.. Poona.	H. V. Bagshawe	.. Burma Dist.
A. O. B. Wroughton	Burma Dist.	H. G. S. Webb ..	.. Peshawar.
I. F. Martin ..	.. Rawal Pindi.	W. W. Browne ..	.. Bangalore.
W. C. Croly ..	.. Secunderabad.	R. Rutherford ..	.. Kirkee.
D. O. Hyde ..	.. Karachi.	W. D. C. Kelly ..	.. Sialkot.
C. H. Carr ..	.. Karachi.	N. E. T. Harding	.. Burma.
		W. C. Rivers. ..	.. Kamptee.
		R. T. Franklin ..	.. Benares.

NOTES FROM LUCKNOW.—Major Beach writes: "Capts. G. J. Haughton, R. T. Brown and H. G. Pinches have recently joined the station from England.

"Major S. Macdonald and Capt. E. C. Hayes have proceeded to England—tour expired; and Capt. A. H. O. Young leaves in February—also tour expired. Capt. F. MacLennan has just received orders to proceed at once to Somaliland. Major Macdonald was one of the 'oldest inhabitants' of the station, and has done much for the mess, and particularly for the mess garden, so that his loss is much felt.

"Sir F. Treves and Lieut.-Col. F. J. Lambkin have both recently visited the Station and the Station Hospital. The latter gave a short lecture on his special form of treatment to the R.A.M.C. officers in the mess. The address was followed by a discussion.

"Capt. R. T. Brown has been working hard at the laboratory since his arrival, and is now able to undertake any bacteriological or analytical work from the district."

NOTES FROM THE PUNJAB.—Capt. Birrell writes: "Capt. A. F. Weston has been appointed to command of the Station Hospital, Fort Attock, with effect from January 1, 1904."

On arrival in India the undermentioned officers have been posted to Stations noted against their respective names:—

Lieut.-Col. T. P. Woodhouse, Rawal Pindi.
Major J. Fallan, Umballa.
Major J. J. Russell, Mian Mir.
Lieut. P. Davidson, Rawal Pindi.
Lieut. C. A. J. A. Balck, Umballa.
Lieut. R. L. V. Foster, Jullundur.
Lieut. S. M. W. Meadows, Mian Mir.
Major J. Maher left for England—tour expired on December 23, 1903.

NOTES FROM SOUTH AFRICA.—Lieut.-Col. Corker writes: "Col. Dorman has assumed charge of Cape Colony in relief of Lieut.-Col. Corker, who has been acting in that appointment for the past eight months. Major Shanahan has sailed in the 'Daucra' on six months' leave. The gallant officer is about to be married."

ROYAL COLLEGE OF PHYSICIANS AND SURGEONS.—Lieut. A. W. Sampey, R.A.M.C., has passed the examination for the Conjoint Diploma in Public Health.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.—The undermentioned Sisters and Staff-Nurses are confirmed in their appointments, their period of provisional service having expired:—

Sisters: Miss J. E. Dods, Miss J. G. Powell, Miss H. Suart.

Staff-Nurses: Miss K. Pearse, Miss E. H. Hay, Miss A. R. F. Auchmuty, Miss D. M. Taylor.

Appointed Staff-Nurses: Miss G. Knowles, posted to Cambridge Hospital, Aldershot, February 1, 1904; Miss B. F. Perkins, posted to Connaught Hospital, Aldershot, February 4, 1904.

The following changes of Station are notified:—

Matron: Miss M. L. Rannie, to Malta; Miss G. E. Saunder to ss. "Plassy," for Indian Troopship duty.

Sisters: Miss G. A. Magill, to Woolwich; Miss J. G. Powell, to Royal Arsenal, Woolwich.

Staff Nurses: Miss E. M. Bickerdike, to ss. "Plassy," for Indian Troopship duty; Miss A. F. Byers, to Royal Arsenal, Woolwich.

BIRTHS.

BARROW.—At Umballa, on December 30, 1903, the wife of Capt. H. P. W. Barrow, R.A.M.C., of a son.

BARTHOLEMEW.—On the 9th inst., at Cranbrook, Lansdowne Road, Aldershot, the wife of Capt. E. Urquhart Bartholemew, Royal Army Medical Corps Militia, of a son.

FALKNER.—On February 20, 1904, at Wellington, Nilgeri Hills, Madras, India, the wife of Capt. Percy Hope Falkner, R.A.M.C., of a son. (By cable.)

SEMPLE.—At Kasauli, Punjab, India, on December 22, 1903, the wife of Lieut.-Col. D. Semple, R.A.M.C., of a son.

STEEL.—On February 23, at the Duke of York's School, Chelsea, the wife of Capt. E. B. Steel, R.A.M.C., of a daughter.

DEATHS.

BAKER.—On January 4, 1904, at 7, Bedford Gardens, Kensington, Honorary Brig.-Surg. James Bowyer Baker, late Surg.-Major Medical Staff, in his 71st year. He entered the Service on May 28, 1857, and retired May 28, 1882. He served in the China War 1860—medal; and also in Madras, Bengal, Canada, and the Straits Settlements.

SCANLAN.—On January 9, 1904, at 9, Coleherne Road, Brompton, Honorary Deputy Surg.-Gen. Fitzgerald Edward Scanlan, in his 70th year. He entered the Service on April 30, 1858, and retired September 10, 1884. He served in Bengal, Cape of Good Hope, Japan, Straits Settlements, and Malta.

HARDY.—On January 14, at Cairo, Mona Ingram, aged 5 months, younger daughter of Major F. W. Hardy, R.A.M.C.

SURGEONS WHO HAVE WON THE VICTORIA CROSS.

COMPILED BY G. F. BLAKE.

Registrar of the Royal College of Surgeons in Ireland.

The Victoria Cross was instituted by Royal Warrant, January 29, 1856. It is provided that not rank, or long service, or wounds, or any other circumstances whatever, save the merit of conspicuous bravery or devotion to the country in the presence of the enemy, shall be held to establish a sufficient claim to the honour. Since its institution less than 500 crosses have been conferred, 26 of which have been awarded to surgeons. The following notes show how each of these twenty-six distinguished members of the medical profession obtained the coveted decoration:—

William Babtie, Major, now Lieut.-Col., R.A.M.C., C.M.G., M.B.Glasg., 1880, L.R.C.P. and S.Edin., 1880, was awarded the Victoria Cross for going out and attending wounded exposed to heavy fire, and afterwards going out, also under heavy fire, and bringing in Lieut. Roberts, who was lying wounded on the veldt. "Colenso, South Africa," 1899.

William Bradshaw, deceased, Assistant Surgeon 90th Regiment, L.R.C.S. Ire., 1854, was awarded the Victoria Cross for gallantly defending the wounded left under his charge, and was himself wounded. "Lucknow, Indian Mutiny," 1857.

Thomas Joseph Crean, Surg.-Capt. 1st Imperial Light Horse, now Capt. R.A.M.C., L.R.C.P. and S.Irel., 1896, Hon. F.R.C.S.Irel., 1902, was awarded the Victoria Cross for conspicuous gallantry in continuing to attend wounded in the firing line under heavy fire at 150 yards range when he was himself wounded, and only desisted when he was hit a second time. "Tygerskloof, South Africa," 1901.

John Crimmin, Surg., now Lieut.-Col. I.M.S., C.I.E., L.R.C.P.Irel., 1882, L.R.C.S.Irel., 1879, was awarded the Victoria Cross for attending wounded actually within the enemy's fighting line, and had at one time to leave his

charge and to fight hand to hand against heavy odds, killing one man with his sword. When help arrived the enemy were driven off. "Burma, India," 1889.

Campbell Millis Douglas, Assistant Surg. 24th Regiment, now Brig.-Surg. A.M.D. (retired), M.D.Edin., 1861, L.R.C.S.Edin., 1861, Silver Medal Royal Humane Society for saving life at sea, was awarded the Victoria Cross for his gallant and daring manner in taking boat through dangerous sea and rescuing seventeen officers and soldiers. "Little Andaman Island," 1867.

Henry Edward Manning Douglas, Lieut., now Capt., R.A.M.C., D.S.O., L.R.C.P.Edin., 1898, L.F.P. and S. Glasg., 1898, was awarded the Victoria Cross for having shown great gallantry and devotion under severe fire in the open in attending a wounded officer, and on the same day attending another wounded officer and men under a fearful fire. "Magersfontein, South Africa," 1899.

Thomas Egerton Hale, Assistant Surgeon 7th Regiment, now Surgeon-Major A.M.D. (retired), J.P., M.D.St. And., 1856, M.R.C.S.Eng. 1854, was awarded the Victoria Cross for remaining with a wounded officer and bringing in wounded under fire. "Sebastopol, Crimean War," 1855.

Edmund Baron Hartley, Surg.-Major Cape Mounted Rifles, now Surg.-Lieut.-Col., Colonial Forces, Cape Colony, C.M.G., L.R.C.P Edin., 1880, M.R.C.S. Eng., 1874, was awarded the Victoria Cross for attending and carrying wounded to a place of safety under fire. "Basutoland, South Africa," 1879.

Anthony Dickson Home, Surg. 90th Regiment, afterwards Surg.-Gen. A.M.D. (retired), K.C.B., M.D.St. And., 1847, was awarded the Victoria Cross for persevering bravery and admirable conduct in defending the wounded left under his charge. "Lucknow, Indian Mutiny," 1857.

Neville Reginald Howse, Capt. New South Wales Medical Staff Corps., L.R.C.P.Lond., 1887, M. 1886, F. 1897, R.C.S.Eng., was awarded the Victoria Cross for going out under a heavy cross fire and carrying a wounded man to a place of safety. "Veredefort, South Africa," 1900.

Edgar Thomas Inkson, Lieut., now Capt., R.A.M.C., L.R.C.P.Lond., 1898, M.R.C.S.Eng., 1898, was awarded the Victoria Cross for having carried a wounded officer over exposed ground to a place of safety under heavy fire. "Tugela, South Africa," 1900.

Joseph Jee, deceased, Surg. 78th Regiment, afterwards Deputy Inspector-General A.M.D., C.B., M.R.C.S.Eng., 1841, winner of the Grand Prix du Casino, Monte Carlo, 1873, was awarded the Victoria Cross for gallantry in attending, protecting, and saving a number of wounded. "Lucknow, Indian Mutiny," 1857.

Ferdinand Simeon Le Quesne, Surg. A.M.D., now Major, R.A.M.C., L.R.C.P. Lond., 1886, M.R.C.S.Eng., 1886, L.S.A.Lond., 1885, was awarded the Victoria Cross for attending a wounded officer in front of the enemy's loopholes, and attending another officer under heavy fire when he was himself wounded. "Burma, India." 1889.

Owen Edward Pennefather Lloyd, Major A.M.D., now Lieut.-Col. R.A.M.C., L.R.C.P.Edin., 1877, L.R.C.S.Edin., 1877, was awarded the Victoria Cross for conspicuous bravery in going to rescue a wounded officer under heavy fire. "Kachin Expedition, India," 1894.

John Frederick McCrea, deceased, Surgeon Cape Mounted Police, M.R.C.S. Eng., 1878, L.R.C.P.Edin., 1878, was awarded the Victoria Cross for attending wounded under heavy fire, although himself wounded, and carrying wounded to a place of safety under fire. "Transvaal War, South Africa," 1881.

Valentine Munbee McMaster, deceased, Assistant Surg. 78th Regiment, M.R.C.S.Edin., 1855, M.D.Univ. Edin., 1860, was awarded the Victoria Cross for attending to, and bringing in, wounded under a heavy fire, and was himself wounded. "Lucknow, Indian Mutiny," 1857.

William Job Maillard, deceased, Staff-Surg. Royal Navy, M.B., 1888, M.D., 1891, Lond. Univ., M.R.C.P.Lond., 1888, M.R.C.S.Eng., 1888, was awarded the Victoria Cross for going through a perfect hail of bullets and endeavouring to rescue a wounded seaman of H.M.S. "Hazard." "Island of Crete," 1898.

William George Nicholas Manley, deceased, Assistant Surg. Royal Artillery, afterwards Surg.-Gen. A.M.D., C.B., M.R.C.S.Eng., 1852, Bronze Medal of

Royal Humane Society for saving life at sea, was awarded the Victoria Cross for risking his life to save Commander Hay, R.N. "Maori War, New Zealand," 1864.

Arthur Martin-Leake, Surg.-Capt. South African Constabulary, L.R.C.P.Lond., 1898, M.R.C.S.Eng., 1898, was awarded the Victoria Cross for attending a wounded man under a heavy fire at 100 yards' range and assisting a wounded officer to a place of safety when he was himself shot three times. "Vlakfontein, South Africa," 1901.

James Mouat, deceased, Surg. 6th Inniskilling Dragoons, afterwards Surg.-Genl. K.C.B., Knight of the Legion of Honour, M. 1837, F. 1852, R.C.S. Eng., was awarded the Victoria Cross for rescuing wounded officer from exposed situation and binding his wounds in the presence of the enemy. "Balaklava, Crimean War," 1854.

William Henry Snyder Nickerson, Lieut., now Capt. R.A.M.C., M.B., B.Ch., 1896, Victoria University, Manchester, was awarded the Victoria Cross for going out and attending wounded man under a heavy rifle and shell fire, dressing his wounds and remaining with him till he was removed to a place of safety. "Wakkerstroom, South Africa," 1900.

Herbert Taylor Reade, deceased, Surg. 61st Regt., afterwards Surg.-Gen. A.M.B., C.B., M.R.C.S.Eng., 1849, was awarded the Victoria Cross for gallantry in dislodging with small force party of rebels firing on wounded. "Delhi, Indian Mutiny," 1857.

James Henry Reynolds, Surg.-Major, now Lieut.-Col. A.M.D. (retired), M.B., M.Ch.Univ. Dub., 1867, Hon. F.R.C.P.Irel., 1879, was awarded the Victoria Cross for conspicuous bravery in attending the wounded under fire and defence of hospital. "Rorke's Drift, Zululand, South Africa," 1879.

Henry Thomas Sylvester, Assistant-Surg. 23rd Regt. (retired), Knight of the Legion of Honour, M.D.Aberd., 1855, L.R.C.S.Edin., 1853, L.S.A., 1869, was awarded the Victoria Cross for going out to a wounded officer and attending wounded under heavy fire. "Sebastopol, Crimean War," 1855.

William Temple, Assistant Surg. Royal Artillery, now Brig.-Surg. A.M.D. (retired), M.B.Univ. Dubl., 1858, L.R.C.S.Irel., 1858, was awarded the Victoria Cross for gallant conduct and devotion in assisting wounded under heavy fire. "Maori War, New Zealand," 1864.

Harry Frederick Whitchurch, Surg.-Capt., now Major I.M.S., L.R.C.P.Lond., 1887, M.R.C.S.Eng., 1887, was awarded the Victoria Cross for rescuing a wounded officer when the troops with which he was fell back, having to proceed over a mile under the enemy's fire. "Chitral, India," 1895.

Hibernian United Service Club. —*Lancet.*

Jan. 1, 1904.

THE R.A.M.C. FUND.

Ninth Meeting.

The Ninth meeting of the Committee was held at 68, Victoria Street, S.W., on Thursday, January, 21, 1904, at 3 p.m. Present:—

Surg.-Gen. Sir William Taylor, K.C.B., K.H.P., Director-General A.M.S. (Chairman).

Surg.-Gen. Sir John B. C. Reade, K.C.B., K.H.S.	Representing
Surg.-Gen. H. Skey Muir, C.B.	Retired
Lieut.-Col. J. F. Beattie	Officers.

Surg.-Gen. A. H. Keogh, C.B.
Surg.-Gen. W. H. McNamara, C.B., C.M.G.
Col. A. T. Sloggett, C.M.G.
Col. H. E. R. James.
Lieut.-Col. E. M. Wilson, C.B., C.M.G., D.S.O.
Capt. G. St. C. Thom.
Capt. and Quartermaster G. Merritt.

(1) The Minutes of the eighth meeting were confirmed.

(2) The Quarterly Report and the accounts of the Band Fund to December 31, 1903, were considered and approved. The accounts are appended to these Minutes (A).

A.

THE ROYAL ARMY MEDICAL CORPS BAND FUND.

BALANCE SHEET FOR QUARTER (OCTOBER—DECEMBER), 1903.

DR.

1903.		RECEIPTS.	£	s.	d.
Oct.	16	Balance Credit from last quarter	84	11	6
,,	16	President, Officers' Mess, Aldershot (September Subscriptions)	4	0	0
,,	21	Ten per cent. on £5 for Special Dinner, Hôtel Metrôpole	0	10	0
Nov.	16	President, Officers' Mess, Aldershot (October Subscriptions)	3	5	0
Dec.	9	Subscription (Capt. H. A. Berryman)	0	5	0
,,	21	President, Officers' Mess, Aldershot (November Subscriptions)	7	0	0
Oct.-Dec.		On Account of Travelling Expenses of Band to R.A.M. College, Hôtel Metrôpole, &c. ..	20	1	3
			£119	12	9

CR.

1903		EXPENDITURE.	£	s.	d.
Oct.	31	Pay of Band (October)	20	2	7
Nov.	30	Pay of Band (November)	19	9	2
Dec.	31	Pay of Band (December)	19	16	7
,,	31	Mr. G. Asch (for Music)	1	16	3
,,	31	Messrs. Hawkes and Son (for new instruments, repairs and music)	21	13	1
,,	31	Messrs. Gale and Polden (Programmes) ..	0	10	0
,,	31	Postage Account	0	2	3
Oct.-Dec.		On Account of Travelling Expenses of Band to R.A.M.Coll., Hôtel Metrôpole, &c. ..	21	15	0
Dec.	31	By Balance Credit	14	7	10
			£119	12	9

ALDERSHOT,
January 1, 1904.

(*Signed*) H. A. HINGE, *Captain*,
Hon. Sec. R.A.M.C. Band.

B.

GENERAL RELIEF FUND.

DR. — BALANCE SHEET FOR THE QUARTER ENDED DECEMBER 31, 1903. — CR.

1903.	RECEIPTS.	£	s.	d.
Sept. 1	Balance from last quarter :—			
	At Bank	94	15	6
	On Deposit	100	0	0
	Interest on Deposit to Dec. 31, 1903 ..	1	17	1
		£196	12	7

1903.	EXPENDITURE.				£	s.	d.
Sept. 1 to Dec. 31	Disbursements to nine cases requiring temporary monthly relief				32	4	0
	Lieut.-Col. E. M. Wilson (for urgent cases) ..				15	0	0
	Sergt. H. Cassell (pay of Clerk)				0	15	0
	Cheque Book				0	5	0
	Postage				0	2	5
	Balance Credit :—						
	At Bank	46	9	1			
	On Deposit	101	17	1	148	6	2
					£196	12	7

ALDERSHOT,
January 9, 1905.

(*Signed*) H. A. HINGE, *Captain, Hon. Sec.*
General Relief Fund, R.A.M.C.

C.

R.A.M.C. WIDOWS' AND ORPHANS' FUND.

DR. — BALANCE SHEET FOR THE QUARTER ENDED DECEMBER 31, 1903. — CR.

1903.	RECEIPTS.	£	s.	d.
Sept. 1	Balance Credit last quarter :—			
	At Bank	80	11	7
	On Deposit	800	0	0
	Interest on Deposit to Dec. 31, 1903 ..	10	1	7
		£890	13	2

1903.	EXPENDITURE.	£	s.	d.
Sept. 1 to Dec. 31	Disbursement to 13 Widows and 1 Orphan (monthly)	60	0	0
	Postage	0	2	11
	Balance :—			
	At Bank	20	3	8
	On Deposit	810	1	7
		£890	13	2

ALDERSHOT,
January 9, 1904.

(*Signed*) H. A. HINGE, *Captain, R.A.M.C.,*
Hon. Sec. Widows' and Orphans' Fund.

D.

R.A.M.C. FUND.

General Fund Appropriations.

Dr. | Cr.

Receipts.		£ s. d.	Disbursements.		£ s. d.
Subscriptions :—			Printing	£24 5 0	
704 Officers on Active List	£708 0 0		Postage	6 4 1	
Less refund of Subscriptions twice paid	4 0 0		Cheque Book	0 4 2	
		704 0 0	Travelling	0 5 6	
59 Officers retired	57 0 0		Clerks	8 13 6	
Less refund of Subscriptions twice paid	1 0 0		Stationery	1 9 9	
		56 0 0	Office materials	2 15 2	
			Accounts passed on December 16, 1902 (Expenses incurred prior to opening of the Fund—See Min. 5 of Second Meeting)	8 8 2	
					52 5 4
			Grants :—		
			To Memorial Fund	353 17 4	
			To Dinner Fund	176 18 8	
			To Band Fund	176 18 8	
					707 14 8
		£760 0 0			£760 0 0

Memorial Fund.

Receipts.	£ s. d.	Disbursements.	£ s. d.
Grant from General Fund	353 17 4	To Jameson Portrait Fund (Minute 5 of Eighth Meeting)	35 5 6
From Forrest Memorial Fund	10 7 8	Balance in hand	360 10 0
Subscriptions specially allocated	31 10 6		
	£395 15 6		£395 15 6

Band Fund.*

Receipts.	£ s. d.	Disbursements.	£ s. d.
Grant from General Fund	176 18 8	To Capt. Hinge for Band (see Min. 8 of Fourth Meeting)	83 2 6
One Active List Officer, Balance of Subscription	0 5 0	Balance in hand (see Balance Sheet)	94 1 2
	£177 3 8		£177 3 8

DINNER FUND.*

Receipts.	£	s.	d.	Disbursements.	£	s.	d.
Grant from General Fund	176	18	8	To Lieut.-Col. Wilson for Dinner, July, 1903 (see Min. 5 of Fifth Meeting)	100	0	0
Two Active List Officers, Balance of Subscriptions	0	10	0	To Compassionate Fund (see Min. 6 of Third Meeting)	77	8	8
	£177	8	8		£177	8	8

COMPASSIONATE FUND.

Receipts.	£	s.	d.	Disbursements.	£	s.	d.
From No. 16 General Hospital	1390	19	2	Balance in hand (see Balance Sheet)	1,468	7	10
From Dinner Fund (see Min. 6 of Third Meeting)	77	8	8				
	£1468	7	10		£1,468	7	10

BALANCE SHEET.

Assets.		£	s.	d.	Liabilities.	£	s.	d.
Cash at Bankers, Current Account :—					To Memorial Fund	360	10	0
Total Receipts as per Bankers' Pass Book	£807 13 2				To Band Fund	94	1	2
Total Expenditure as per Bankers' Pass Book	281 1 1				To Compassionate Fund	1,468	7	10
		526	12	1				
Cash at Bankers, Deposit Account		1,390	19	2				
Cash in hands of Hon. Secretary		5	7	9				
		£1,922	19	0		£1,922	19	0

January 21, 1904.

B. SKINNER, *Lieut.-Col.*,
Hon. Sec., R.A.M.C. Fund

* Subscriptions allocated by Retired Pay Officers to Band and Dinner have been placed direct to credit of the old funds.

The Committee approved of the grant of £60 for this quarter, applied for by the Band Sub-Committee to meet necessary expenditure, which includes the purchase of certain new instruments.

(3) The Quarterly Report and Accounts of the Compassionate Fund to December 31, 1903, were laid before the Committee, and were approved.

The accounts are appended to these Minutes (B and C).

(4) The final statement of accounts of the Special Dinner Fund were considered and approved by the Committee. These accounts showed a balance from previous accounts of £21 0s. 5d., and subsequent expenditure on administration and return of surplus subscriptions amounting to £20 10s. 6d., leaving a final balance of 9s. 11d.

Lieut.-Col. Wilson was authorised to place this balance in the General Relief Branch of the Compassionate Fund.

(5) The accounts of the Royal Army Medical Corps Fund, up to the end of 1903, were considered and approved by the Committee, and are appended to these Minutes (D).

(6) In accordance with Minute 7 of the last meeting, Capt. Waring was communicated with, and replied that the subscribers to the Forrest Memorial would be pleased to leave the question of the Memorial and the place where it is to be put up in the hands of this Committee.

Under these circumstances the Committee decided that Capt. Forrest's name, with an appropriate inscription, should be added to the tablet for the R.A.M.C. officers in the Garrison Church at Aldershot. On the proposal of Surg.-Gen. McNamara the execution of this work was referred to the Aldershot Sub-Committee.

(7) As directed in Minute 6 of the last meeting, Messrs. Holt and Co. were communicated with on the subject of the sum which should be kept in the current account as an adequate balance. Messrs. Holt and Co. replied on November 11 last, that it would be difficult to say what balance would be adequate to cover the work entailed in keeping the current account of the Royal Army Medical Corps Fund, until they have had twelve months' experience of the account after the Fund is in full working order. They accordingly suggest leaving the matter over until the end of 1904.

After some discussion in which it was pointed out that it was probable that there would be a very large balance at Messrs. Holt and Co.'s this year, the Committee decided that the Hon. Secretary should be empowered to place a sum on deposit after arranging the most favourable terms obtainable with Messrs. Holt and Co.

(8) On behalf of the subscribers the Committee of the Fund for a Memorial to the late Surg.-Gen. Nash asks the Royal Army Medical Corps Fund to accept a balance remaining on its hands of £5 17s. 3d., and to place that sum to the credit of its Compassionate Branch, to be applied to the same purposes as the General Relief Fund.

The offer was accepted with a vote of thanks to the Committee and subscribers of the Nash Memorial Fund.

(9) The Committee next examined the design for the proposed tablet to the late Surg.-Gen. J. B. Hamilton, submitted by Lieut.-Col. Hubbard's Sub-Committee.

With a slight verbal amendment in the legend and the selection of a larger coat of arms for the head of the tablet, the design was approved.

The Hon. Secretary was requested to submit the design to Mrs. Hamilton before returning it to Lieut.-Col. Hubbard for execution.

(10) Surg.-Gen. Muir informed the Committee that a sum of money, amounting to £438 18s. 4d. was collected in 1902 by a lady (wife of a London surgeon, who wishes to remain anonymous), with a view of endowing a bed at the Bisley Homes, or establishing a Cottage Home for the R.A.M.C. The money was handed to H.R.H. the Princess Christian, who now holds it; but as it fell short of the amount required (£600) to meet the proposed undertaking, it has remained idle in a Bank.

He therefore proposed that the sum of £161 1s. 8d. be voted from the General Relief Fund, and placed at the disposal of Princess Christian, to complete the sum of £600, which would then be available as an endowment of a

"Princess Christian Cottage Home," to be administered by the "Incorporated Soldiers' and Sailors' Help Society," Her Royal Highness having expressed her approval of the scheme.

In the discussion which followed it was pointed out that the "Cottage Home" would always be available for a man of the R.A.M.C., to whom the system organised by the Soldiers' and Sailors' Help Society insures free quarters, fuel and light; reference to the officer commanding the Corps being made in the selection of deserving recipients.

The Committee approved of Surg.-Gen. Muir's proposal and voted the sum of £161 1s. 8d. necessary to complete the £600 required for this purpose; this money to be drawn from the General Relief Fund, £100 being obtained from the Aldershot account, and the balance from the R.A.M.C. Fund Compassionate Branch.

(11) The Director-General suggested to the Committee that the time had now come when memorials to distinguished officers might with advantage, be taken in hand; he proposed that the Committee should consider the question of raising a memorial of a lasting character to the late Professor of Hygiene, Surg.-Major De Chaumont, F.R.S.

After a full discussion of the subject the following resolutions were passed:

(*a*) That the sum of £200 should be given from the Memorial Fund for the purpose of creating a "Trust" to be called the "De Chaumont Prize;" that this sum should be invested in a Trust security giving the most favourable rate of interest procurable at the time; that the interest accruing on this sum should be expended twice a year in a prize in Hygiene to be competed for at the passing-out examination at the College, by Lieuts. on Probation of the R.A.M.C. going through the Junior course at the Royal Army Medical College; that the trustees be the Director-General, Army Medical Services, and the Commandant, Royal Army Medical College, for the time being.

(*b*) That the undernamed Sub-Committee should consider the general principle involved in the Director-General's proposal and report to the Committee the names of those whom it considered should be selected as worthy of being memorialised as distinguished Officers.

Lieut.-Col. Beattie,
Col. James,
Surg.-Gen. McNamara,
Surg.-Gen. Skey Muir.
Col. Sloggett.

(12) On the proposal of the Director-General it was unanimously resolved that membership in the R.A.M.C. Fund should be offered to officers of the Auxiliary Forces who have been granted honorary army rank in the R.A.M.C. on account of embodied service at home in consequence of the South African War, or active service in that country.

The Hon. Secretary was authorised to communicate this resolution to the officers concerned.

B. Skinner, *Lieut.-Col.*,
Hon. Sec.

January 22, 1904.

NOTICE TO SUBSCRIBERS.

Officers are particularly requested to give timely notice of changes of station or changes of address, in order to ensure the posting of the Journal to its correct destination.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, &c. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts and commands at home and abroad. All these communications should be written upon one side of the paper only, and be addressed to the Editor, Journal of the Royal Army Medical Corps, 68, Victoria Street, London, S.W.

Letters regarding subscriptions, non-delivery of the Journal, or change of address, should be sent to Major T. McCulloch, R.A.M.C., 68, Victoria Street, London, S.W.

Communications have been received from Lieut.-Col. T. J. O'Donnell; Majors F. Smith, P. G. Jevers, M. P. Holt, S. F. Freyer, J. B. Buchanan, N. Manders; Captains T. Gunter, Statham, T. V. Jones, E. T. F. Birrell; Lieut. A. Hall, Lieut. and Quartermaster F. Bruce, Civil Surg. H. J. Mackay.

In the event of reprints of articles being required by the authors, notification of such must be sent when submitting the papers. Reprints may be obtained at the following rates:—

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200	,, ,,	11	6	,,	19	0	,,	9	0

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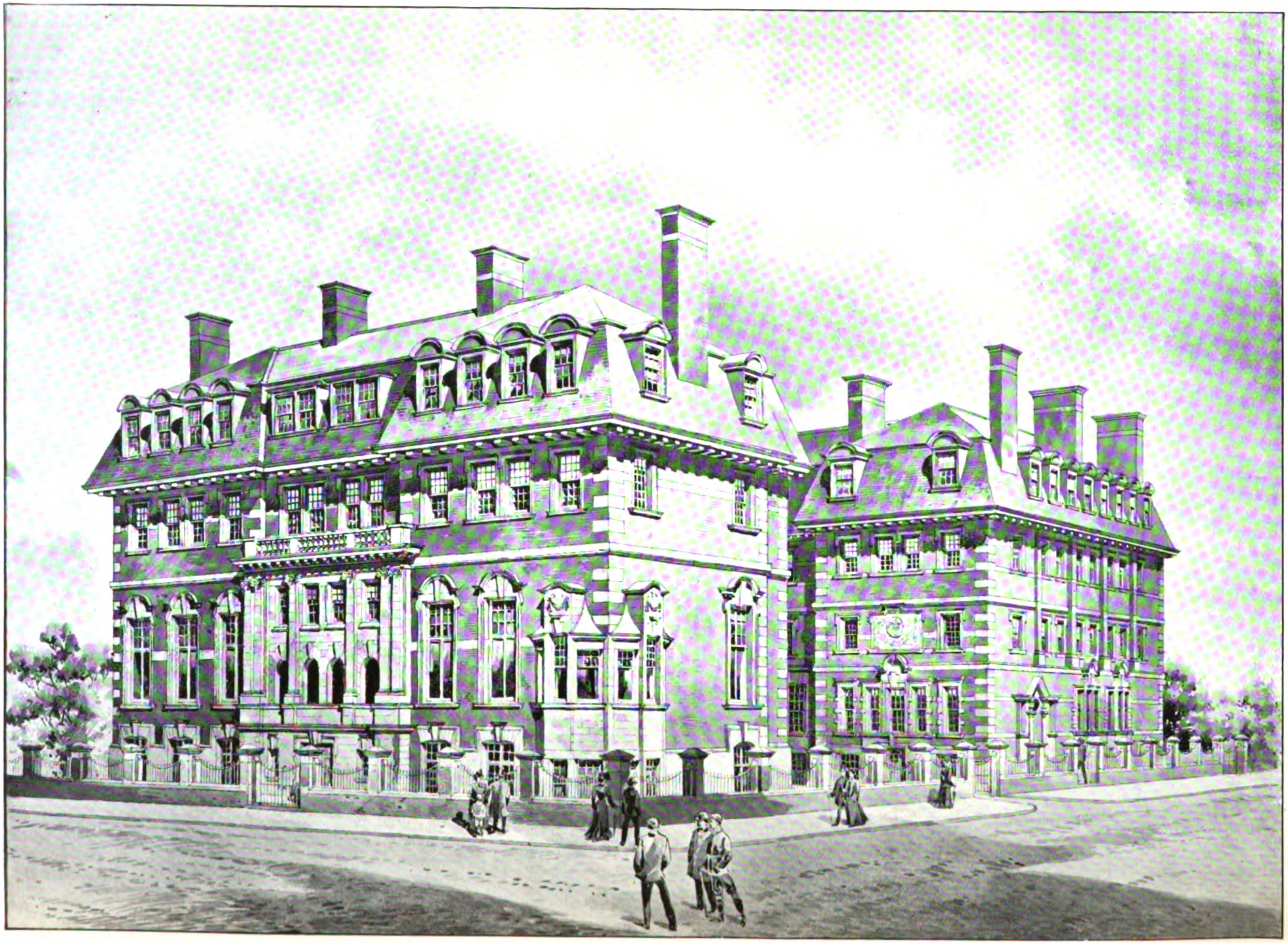
The following periodicals have been received: *The Medical Record, The Medical News, New York Medical Journal, Gazette Med. de Paris, Il Morgagni, The Medical Review, El Siglo Medico, Der Militärärzt, Deutsche Militärärztliche Zeitschrift, Anales de Sanidad Militar, Revue Med. de la Suisse Romande, La Medicina Militar Española, The Boston Medical and Surgical Journal, Annali di Med. Navale, Giornale del Regio Esercito, Le Caducée, The Hospital, The Ophthalmoscope, St. Thomas's Hospital Gazette, Bulletin de l'Acad. de Med. de Paris, Arch. Med. Belges, Voyenno Medisinskii, The Indian Medical Gazette, The Australasian Medical Gazette, Journal of the Association of Military Surgeons, U.S., Militarlagen ungwet af Militarlaegeforeningen,* J. Kjobenhaur, *The Veterinary Journal.*



Bird's-eye View of Royal Army Medical College (Mess and Officers' Quarters Block) from the North-east.

VOLUME II. APRIL, 1904. No. 4.

Journal

of the

Royal Army Medical Corps.

Original Communications.

ROYAL ARMY MEDICAL COLLEGE.

BY THE COMMANDANT.

IN continuation of the account of the proposed buildings of the Royal Army Medical College, a bird's-eye view and the plans of the Mess and Officers' Quarters Block are presented to our readers in this number.

This block lies to the east (toward the river) of the laboratory block previously described, separated from it by a passage for access by tradesmen to the two buildings. It occupies a space in the shape of a right-angled triangle, whose acute angles are truncated. Its northern side measures 175, and its eastern side 150 feet. The style of architecture is in keeping with that of the other buildings in the enclosure.

It is to consist of a basement, an upper and lower ground floor and three storeys, forming the mess, with its offices, the Commandant's house, and quarters for the officers under instruction.

The basement is devoted to hot-water pipe subways, cellarage, and the boiler house.

The lower ground floor contains: In the oblong block parallel with the laboratory block, the kitchen and scullery placed centrally, flanked by yards to the north and south, by a coal store to the west, and a corridor to the east.

The Commandant's house is to the north of the north yard, and the larder, boot-room, &c., to the south of the south yard.

The mess waiters' room, store room, messman's office, &c., are on the east side of the corridor.

A limb projecting at right angles to and from the centre of this block, and with short limbs jutting out from it, one from its centre to the south and the other from its extremity towards the north, contains, in the order given from west to east: the pantry, safes, plate room, mess waiters' dormitory, a billiard room for two tables, the entrance hall, a visitors' room, and lavatories. Lifts for sending up coals to the quarters and dinner from the kitchen to the officers' mess-room commence on this floor.

The kitchen and scullery cease on the level of the upper ground floor. On this floor are the messman's living rooms in the south portion of the main block, and the Commandant's house is to the north.

Two quarters for senior officers are in the centre of the block and to the west of the corridor, which is repeated on this floor, two more to the south-east of the corridor, and one is interposed between the long limb and the Commandant's house.

The long limb contains the serving room, the mess-room, and the ante-room.

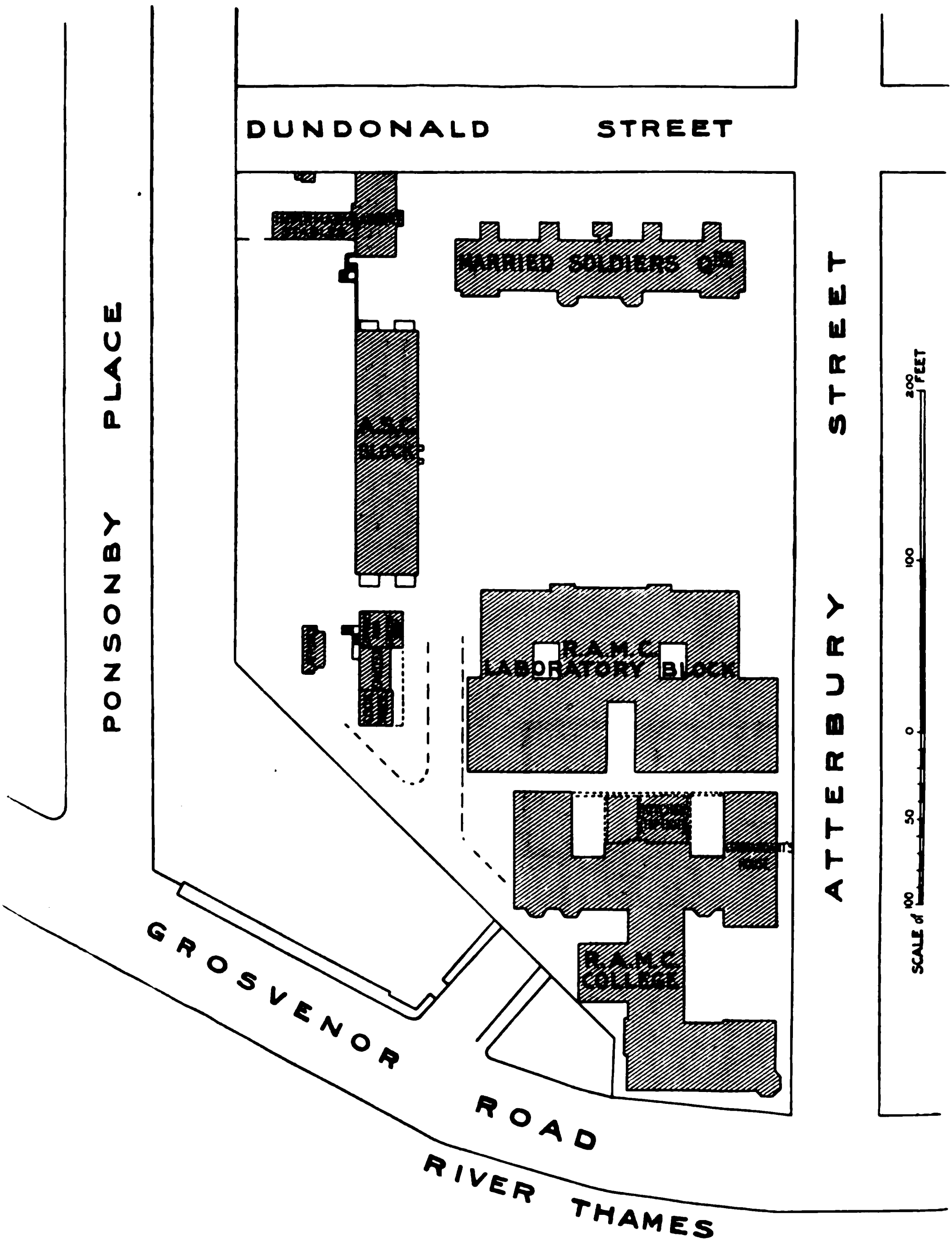
The mess-room measures 50 by 35 feet, and the ante-room 45 by 35 feet; both are two storeys high, and they can be thrown into one by the opening of folding doors.

The smoking room is also on this floor, and between it and the ante-room is a balcony, which is over the entrance. The ante-room and the smoking room look over the river.

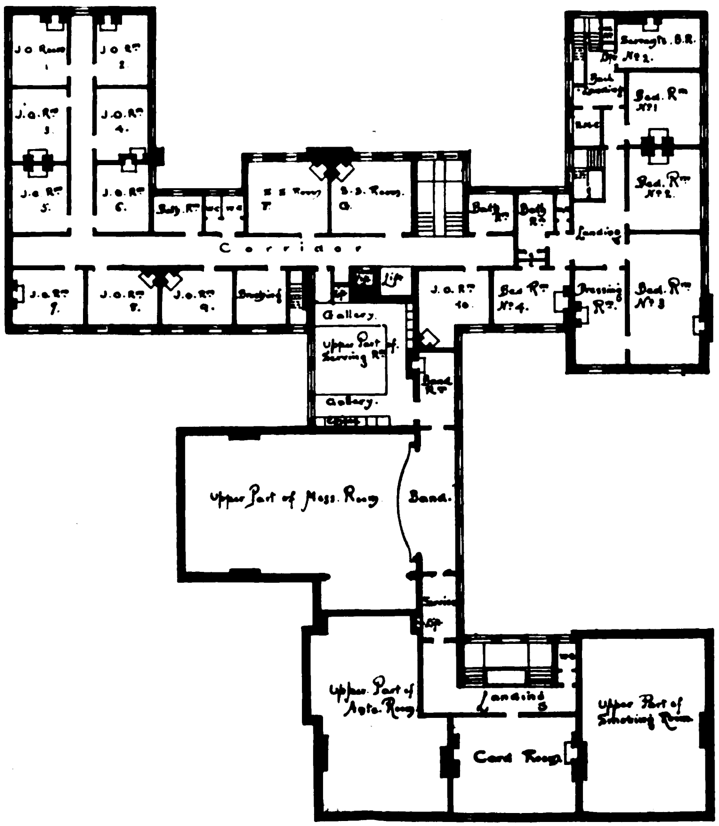
On the first floor the main block is taken up by officers' quarters.

The long limb has in it the upper parts of the serving room, the mess-room (with a band alcove), the ante-room, and of the smoking room, and there is a card room over the balcony.

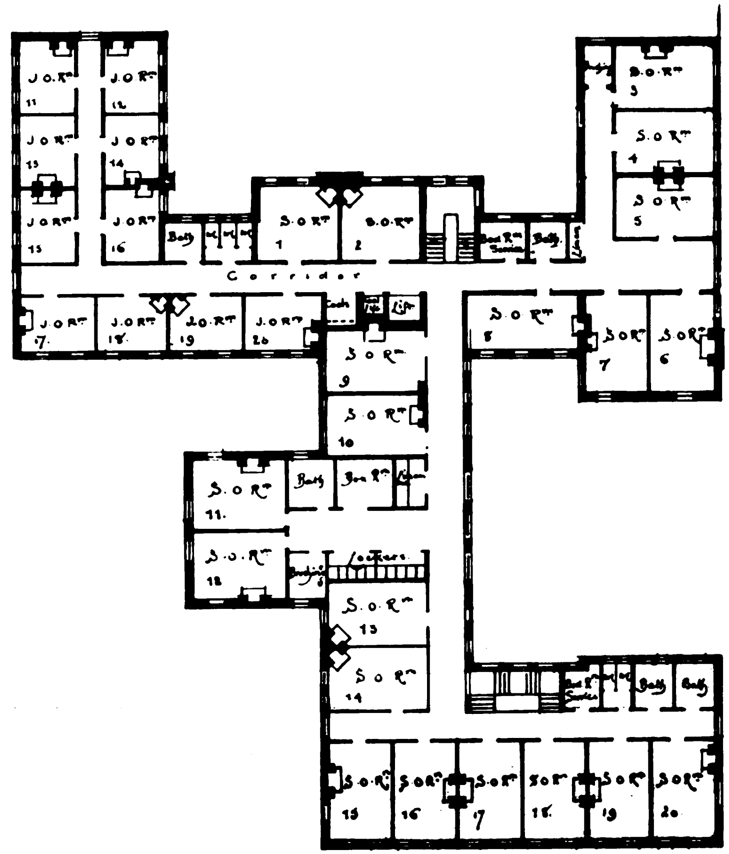
The second and third floors are entirely occupied by officers' quarters. There are quarters for seventy-seven officers in all, exclusive of the Commandant. Well-lighted corridors run through the long axes of the buildings, into which the quarters



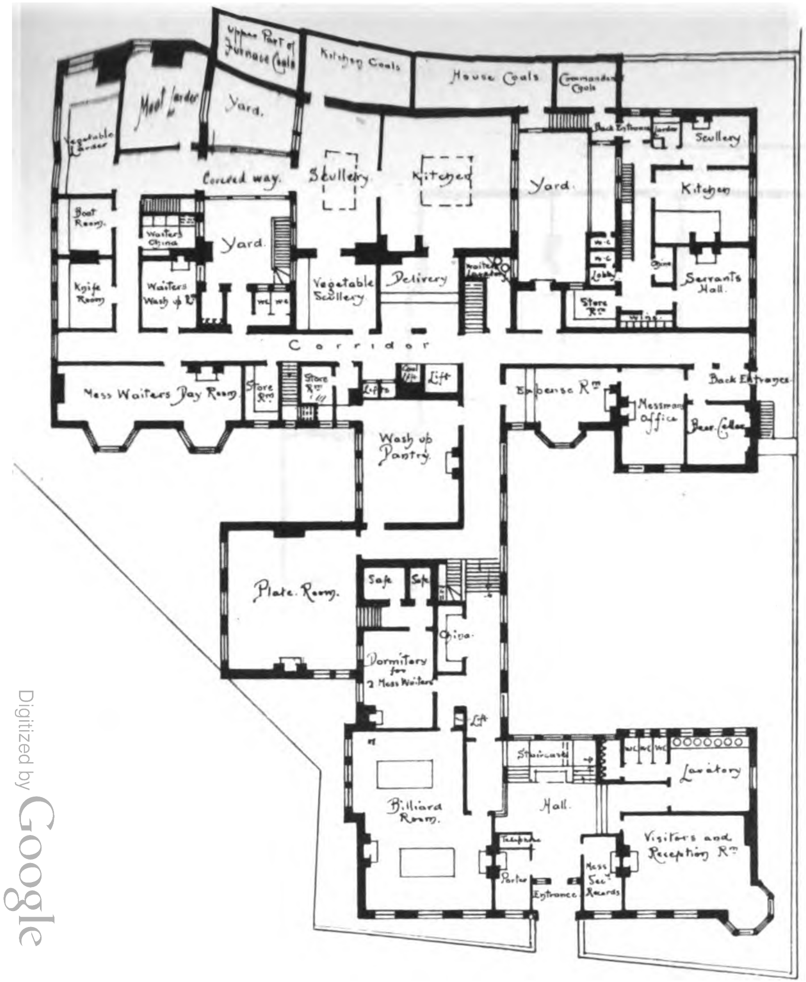
Block Plan of R.A.M.C. College Buildings showing Relation to A.S.C. Barracks and Locality.



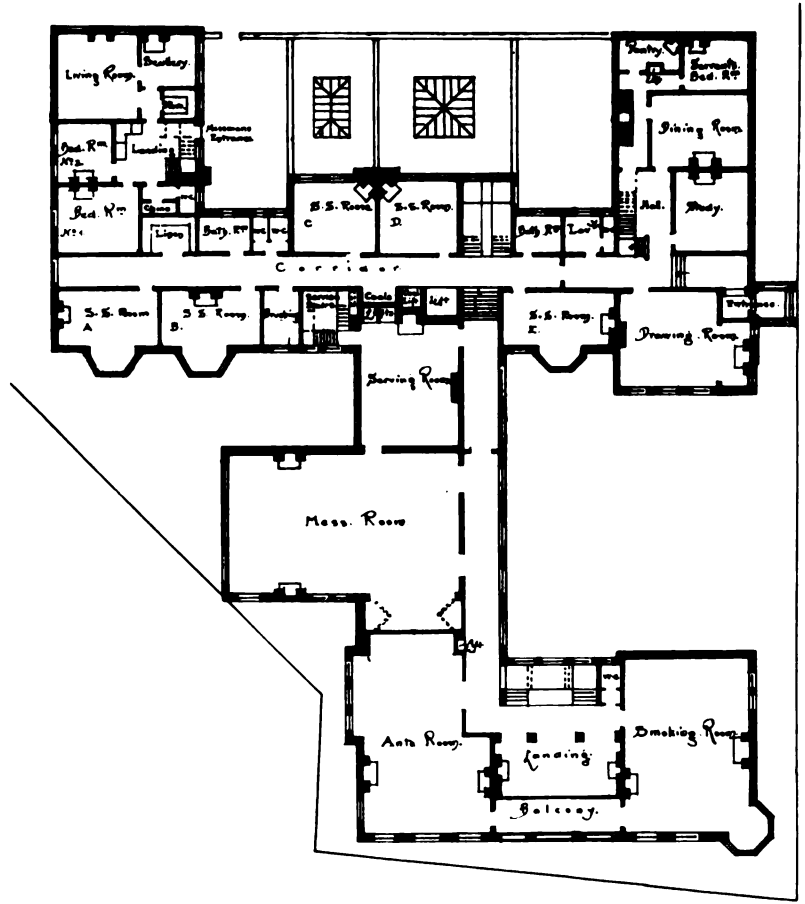
Plan of First Floor.



Plan of Second and Third Floors.



PLAN OF LOWER GROUND FLOOR.



Scale of Feet

PLAN OF UPPER GROUND FLOOR.

open. The quarters themselves are roomy, and each has its fireplace, the bulk of the building being warmed by means of hot-water pipes.

Bath-rooms for hot and cold water baths are provided in the proportion of one to every six quarters. On each landing there is a brushing and cleaning room for the officers' clothes.

The blocks together will form a very worthy place of dwelling and study for the Medical Officers of the Army, and will surely tend to attract, for the purpose of scientific and social intercourse, all who find themselves in London, whether on returning from foreign stations or on leave from home stations.

A SKETCH OF THE MEDICAL GEOLOGY OF SOUTH AFRICA.

By Lieut.-Col. BRUCE SKINNER.
Royal Army Medical Corps.

Part II.

The necessity for guarding bridges across rivers leads to the certainty that such localities will become occupied by troops in war time. When the river-bed itself is a constant source of water, the question of supply becomes one only of transport to the camp. But when the supply from the river is scanty, and perhaps intermittent, it is imperative that wells should be provided to supplement the shortage.

The following diagrammatic section (fig. 11) through the banks of the Vet River, immediately below the railway bridge, shows the points to be looked for in the search for water in similar localities.

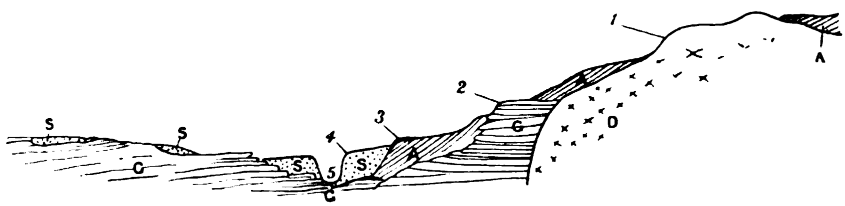


Fig. 11.—Section across bed of Vet River, about the level of the railway bridge. D, Diabase; A, dark alluvium; S, sand; G, grits and sandstones with thin intervening shale; 1, level of original land surface; 2, second level; 3, third level; 4, fourth level; 5, modern river-bed.

Here we have a picture of a disappearing river, which has dwindled down from a mighty flood to an intermittent hill stream only retaining sufficient force to maintain a channel through steep sandy banks in the position marked 5. The bridge was 60 feet above the river-bed at this situation. Water during rainy seasons will be retained in small quantities at the bottom of sandy (S) and alluvial (A) strata, as the absorption by the underlying grits and sandstones (G) will be comparatively slow. Such water will further be charged with surface impurities, but a good supply will be procurable by boring into G, down to some feet below the modern bed,

keeping clear of the diabase (D). This section may be taken as a good example of the conditions prevailing in all the river-beds of this country.

A little north of this bridge is an important position called Smaldeel, or Winburg Road Station, situated nearly at the top of the rise from the Vet River. The railway station is on the side of a rounded hill, not far from the summit. The hill has a thin cap of dolerite, beneath which are horizontally bedded mudstones, succeeded by grits and sandstones with thin shaly intervening layers. Below these are mudstones. Below the last are boulder sandstones, through which the Vet River cuts its way to the east 200 feet below the level of the station, but higher up-stream than the locality sketched above, where the bridge crosses the Vet. A well had been sunk at the summit of this hill, through the dolerite cap into the mudstones; but needless to say, contained no water within reasonable depth. In such a position it is necessary to go some distance down the hill to a locality uncovered by dolerite. As, however, there is a village near the station, and during the war there was a camp near the same spot, all water within the rocks for some distance round must have become polluted with organic matter unless drawn from a great depth; still it was necessary to obtain water near, and it was found on the northern side. Here, where the hill joined in a curve with an adjacent hill, the rocks were covered with a certain amount of diluvial soil which helped to retain the water, and by sinking a well into the sandstones a constant supply was obtained, which, used for railway purposes, furnished also sufficient water for the drinking supply of the camp.

These two localities are good examples of two types of situations for which water supply had to be provided within close reach of the camp. Some places, such as Wolvehoek and Standerton, required careful investigation before a spot free from the volcanic diabase could be found, so as to provide a sufficient supply. All these instances show the extreme importance of providing an army in the field with sufficient water-boring apparatus, with machinery sufficient to raise the water from depths at which the ordinary pump cannot operate.

Dykes.—As has been pointed out above, dolerite (diabase) is practically impervious to water, and when it occurs as a dyke,

holds back the underground water. Such dykes do not always reach the surface of the ground. Working upwards from the interior of the earth, the molten material of which they were composed forced its way sometimes above the surface, when it became poured out as a lava sheet; sometimes it intruded between layers of rock; sometimes it remained at varying distances below the surface, the energy of expulsion having been insufficient to carry the mass right through the crust.

When the surface is covered with diabase it is not of any use attempting to bore through it. Also, when after boring through sedimentary rock, the bore strikes the volcanic rock, to continue the boring will be futile if the object is to find water; but if the exploration is made through sedimentary rock on the side of the dyke towards which the country slopes, the discovery of water is practically certain within a short distance of the surface. Further, it will be found that the opposite side of the dyke will require a deeper bore before water is struck, unless that side happens to form the lower end of another drainage slope whose water is held back by other dykes running across its line of flow.

Water in Distorted Regions.—These principles hold good also in those portions of the country which bound the region of horizontal rocks lately under consideration; due weight being given to the fact that in the distorted regions the surface water follows the dip of the rocks, sinking below the surface deposits until brought to a standstill by a change in the configuration of the containing strata. In order to calculate where to strike this subsoil water a careful estimate has to be made of the angle of dip. These tracts of country present different physical aspects, according as the strata consist of distorted sedimentary rocks, or of volcanic masses, such as the granite of the Bushveldt in the Transvaal, and that of Swazieland, and the granite bosses of the Witwatersrand or of Vredefort. The water supply of such localities depends upon the surface distribution; it does not sink into these igneous rocks deeper than their outer disintegrated surfaces.

In regions of distorted rocks such as are found around the granite areas, the condition of things finds its origin in a remote past. The tilted rocks have been in their present condition for ages which are impossible of computation in figures;

their age can be measured only by the position they assume in the succession of the rocks of the country. That is to say, they are found to have been tilted before the rocks, many thousand feet in thickness, which, still horizontal, are found in some places to be placed above them. In many places where such horizontal rocks are not above them they may be assumed to have been carried off by denudation processes. The distorted rocks also are found to have suffered from denudation, for they have breaches carved in them by stream action, while their intervening valleys contain deposits formed by water-borne and wind-borne material. The diagram (fig. 12) representing the country immediately to the east of Pretoria shows the series of rocks tabulated above as (4) (see Part I.). The rocks are

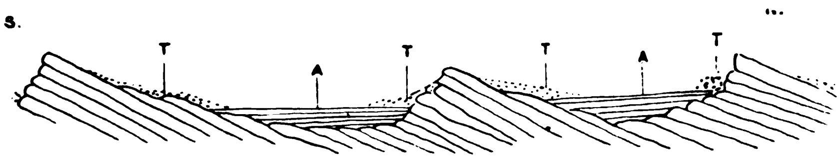


FIG. 12.—Pretoria (Wittebergen Quartzites) series, east of Pretoria. A, alluvium; T, detritis from decomposition of rocks.

quartzites and much indurated mudstones and sandstones, with intrusions of amygdaloidal trap. There is a series of east and west valleys separated by ridges. The summits of the ridges are composed chiefly of the outcrops of quartzites, the bed-rocks of the valleys are chiefly mudstones. The most dependent parts of the valleys contain, lying upon the older rocks, fluviatile deposit, through which at intervals winds a stream whose general direction is northerly. On the higher ground are deposits of clay and sand formed from rock decay.

Such a series of metamorphosed, and consequently hardened, rocks does not allow of much percolation. Such percolation as takes place has a tendency downwards, through fissures and joints, to an unknown depth, possibly checked here and there by the dykes of trap, but not held in large accessible quantity.

On the other hand, the surface supply is more plentiful, for the very reason that prevents percolation. In this locality the streams flow northwards through deep gaps carved through the east and west ridges to join the Apies and Pienaar Rivers,

meandering through the alluvial deposits formed by water-action at a period when the drainage, formerly west to east, had no exit from the valley. By sinking wells in this alluvium, which is sometimes of considerable depth, water can be found always. The quality is another consideration.

In a tract of country forming a belt south of Pretoria is a series of rocks called dolomitic. This belt widens considerably to the west until terminated near the western frontier of the Transvaal by a series (No. 2) of quartzites and other indurated rocks (schists). These dolomites have been dissolved in places after the manner of limestones, by underground water, with the result that surface waters disappear into underground channels, only to appear again when less soluble rocks, which act as supporters to the underground stream, and thus prevent further descent, approach the surface.

In the Waterberg to the north of the Transvaal and in the south-east (Standerton, Ermelo, Utrecht, Vryheid, Wakkerstroom and Piet-Retief districts) the conditions are those of the horizontally bedded rocks previously described.

Soils.—Mention has been made of the detrital material of decomposed rocks. A sketch of the main varieties under the name of soils is called for as further explaining the nature of the country. These soils are primarily of two classes: first a clay or brick-earth, and second sand. These main sub-divisions are varied by admixture, and by the fact that in places they retain evidence of modification, through having formed a nidus for former vegetation.

(1) The clay forms the red soil which is so conspicuous a feature of the country. It is the result of decomposition of the volcanic rocks, the most common source perhaps being the diabase so frequently mentioned in this sketch, and is consequently found most pure on those talus slopes descending from hills formed chiefly of this kind of rock. It occasionally happens that a hill is formed on one side of diabase and on the other of sedimentary rock; in such cases the contrast of the soils resulting from the disintegration of each is marked. Wherever the prevailing colour of the country is red it may be taken for granted that the volcanic rock predominates.

Diabase is chemically a ferro-magnesian silicate of alumina

and lime. The clay, when pure, forms a stiff ferruginous brick-earth, from which rich-coloured red bricks are made. The photograph (fig. 13) shows a pit from which the clay has been removed for brick-making, leaving rounded blocks of dolerite, representing the core of the blocks whose concentric weathering had provided the clay. In the background some of the clay may be seen with blocks of dolerite embedded in it.

The lime of the parent rock seems to be the first constituent got rid of by disintegrating processes. Being readily

Fig. 13.—Fragments of diabase in a clay-pit. The clay has been removed for brick-making. The pit lies above a dyke of diabase situated to the west of Bloemfontein.

soluble it is carried away by percolating water, but is redeposited when the water evaporates. In a quarry recently worked at the south-west corner of Naval Hill at Bloemfontein in sedimentary (sandstone and mudstone) rocks, the sandstone at one point in the quarry has the appearance of a sandy chalk (see fig. 14). On investigation it is found that behind the rock in question decomposing diabase is situated, and that the lime has been washed out of the latter and redeposited in the sandstone owing to the evaporation of the percolating water.

On talus slopes the lime does not rest. It is carried down to the valleys by the flood water. This percolates through the sandy diluvium of the valleys and rests upon the harder underlying rocks; some portion of the water is absorbed by the

rocks, some portion is evaporated. That which is evaporated deposits its lime, with the result that a layer of travertine is formed (see fig. 15). This condition is very marked in the country traversed by the railway from the Orange to the Modder Rivers.

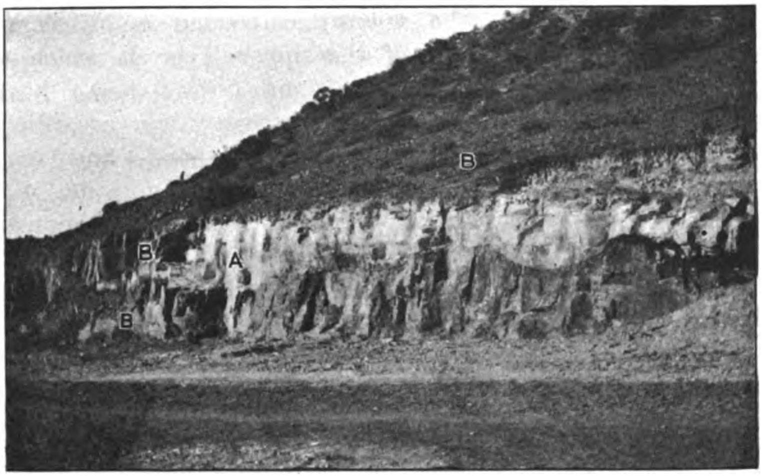


FIG. 14.—Quarry against Naval Hill, Bloemfontein, showing (A) sandstone containing infiltrated carbonate of lime, which has been washed out of the (B) diabase rock beside and behind the sandstone.

FIG. 15.—In the bed of the Bloemspruit, east of Bloemfontein. T, layer of travertine; below it are grey shales, above is diluvial deposit.

A section at Modder River Camp in a bank which formed an ancient boundary of the river on its southern side, situated at about 1½ miles west of the bridge, showed this travertine interbedded with sandstone. At another point in the continua-

tion eastwards of the same bank a deposit of 5 feet in thickness of travertine was observed. Further down the railway towards Orange River this deposit is exposed on the surface as a white crumbling lime, and has given for the locality the name of Chalk Farm.

At Osfontein Farm, near Paardeberg, a section made for a water channel showed the travertine resting on a denuded shale, the broken fragments of the upper layer of which were partially embedded in the lime.

The thickness of the beds of travertine varies according to the quantity of diabase in the neighbourhood, and is also dependent upon the extent to which the configuration of the ground permits of the percolated water resting long enough to allow of deposit of its lime. In some situations it forms a semi-translucent amorphous faintly yellow deposit; in others it is white and friable.

The magnesia of diabase is retained by the clay more tenaciously than the lime, and is found in the water of wells dug through such soil.

The lime and magnesia having been removed from the disintegrated diabase, iron and alumina silicate are the constituents of the residual clay now under consideration. It is seldom pure, owing to the admixture of sand from other rocks. The soil formed by the admixture is selected by the farmers for garden produce and fruit trees, and that is probably one reason why the farm-house of the district is invariably at the foot of a hill; another being that the clay is more retentive of moisture. The wild olive of the country is usually found in this clay on the hillsides. In the valleys the bulbous plants so frequent in this country seem to select this soil.

The following analysis made by Lieut.-Col. R. H. Firth, R.A.M.C., of the red clay, from a sample brought to England from near Pretoria, may be of interest:—

Water...	4·1 per cent.
Organic matter	2·9 " "
Lime	1·8 " "
Alumina	25·5 " "
Silica and insoluble matter...	63·4 " "
Potash...	0·3 " "
Chlorides	0·5 " "
Phosphoric acid	0·4 " "
Magnesia	Traces.

Although the clay is more retentive of moisture than other soils in South Africa, it is less so than the clays of temperate climates. In countries where a fierce sun rapidly bakes the top soil, cracks are produced, extending for some distance downwards; through these the subjacent moisture is evaporated, and the superficial portions become easily pulverised. The great value of the soil as a check to the rush of rain water depends much on this superficial fissuring; flood water, instead of running rapidly off, sinks into the cracks, and is thus delayed on its road to the river.

(2) The sandy soil of South Africa is the result of disintegration of the sandstones and mudstones. Sand is washed down rapidly by the heavy rains to the valleys, where it is swept into the rivers and is responsible for their muddy condition. In valleys whose outlet has not been free the sand has been deposited in layers varying in colour with the amount of vegetation which was once present at the period following deposit. In some districts there is no carbonaceous deposit; but wherever found, the sand bears evidence of having been deposited in depressions of the surface. In some places the deposit of sand presents a flat expanse between neighbouring hills, indicating silted-up lakes; in others it is the site of a stream or river which has cut its way through such a silted up lake, and in doing so has exposed the stratified nature of the deposit. Along the Modder River, banks of this stratified sand as much as 40 feet in depth may be seen. This fluviatile deposit may be expected to contain the fossil remains of the fauna and flora of the period during which it has been laid down. The records of such remains are scanty. Very occasionally a few shells of fluviatile molluscs, such as the ubiquitous *Unio*, may be discovered embedded; occasionally small lenticular patches contain the remains of ferns. A portion of a horn-core of a wildebeeste was dug out at one spot, while at another a minute phalanx from the foot of some mammal was found by the writer.

The superficial sand is easily moved by the wind, and after a dust-storm the surface is found ripple-marked over wide areas. It is not unlikely that the ripple-marks so often found preserved in the old sandstones may have been produced by a similar process.

The camel thorn (mimosa) grows freely along the sandy banks of the rivers and on the sand flats, when these are not high above the water level. Where watered, melons are produced freely on this class of soil. As a rule, however, the vegetation is scanty in proportion as the sand prevails, and lasts only for a short period after the rainy season.

(3) In some localities a black clay is found. This is the result of the clay from a diabase rock having had its moisture retained owing to some mechanical obstacle to outflow of the flood water, and as a consequence having formed the site of a considerable vegetation. On decay the plants have left their carbon in the soil, thus producing the black colouring. Occasionally wide tracts of such dark clay are found, but then contain a considerable sandy admixture. When once the obstacle to outflow of the water has been removed, these clays, unpleasant swamps in rainy weather, rapidly dry and form a crumbling soil full of fissures from the shrinkage of the clay under the heat of the sun, as well as from the removal of some of its components in solution by the percolated water.

To the soldier the nature of these soils is one of some moment. If his camp is pitched on a sandy area, a breeze fills his clothes, his bedding and his food with grits and dust. The trenches dug round his tent are obliterated at one time by rain, at another by wind. His tent-pegs and picketing-pegs will not hold. His latrines, easily dug, provide scanty material for chemical combination with the excreta, while the emanations travel upwards through the porous covering, and solutions travel rapidly downwards. The glare from the sun is painful; the mid-day heat is excessive, and the night radiation and evaporation when the sky is clear reduce the temperature to such an extent that the diurnal ranges become extremely wide.

The clays are cold and damp during rains, but rain is not frequent. Though the red and black soils absorb more heat than the sands, the air above them is not so hot in the mid-day, while at night the fall of temperature is not so marked as on sandy soil. There is less dust, partly because of the coherent nature of the soil, partly because vegetation tends to grow better on the clays. Broadly speaking, the clays are the soils of the high ground, the sands of the lower—even if for

no other reason this fact is sufficient to indicate that the clays in South Africa are usually preferable as sites for camps, temporary or permanent. Latrines are more advantageously placed in such soils than in sands, while the minor objections adverted to above regarding trenches and tent-pegs are not applicable in clays. The glare is *nil*, while dust-storms, though carrying a dirtier-looking material, do not produce the same amount of dust as over the sandy soils.

The question of water supply mainly depends in this country on other conditions, described above, than the condition of the soil, which after all is generally scanty. Surface wells are not to be thought of except in an emergency. If they should be necessary, the clays of the higher ground must be avoided as not affording water; this will be found in the more dependent part of the country if the soil happens to be deep enough to have guarded the percolated water from evaporation. Sometimes the valley has been formed as a deep trough in the bed rock, and this trough has filled up with diluvial clay and sand, as on the east of Pretoria, or in some of the natural "pans" (lakes or ponds) which are scattered about the country. It will probably be found that a pan, apparently an arid expanse at its surface, contains water at some depth below ground. Apart from their value for agricultural purposes, these superficial deposits are chiefly of use in detaining the water of the surface, at the same time protecting it from immediate evaporation, thus giving it time to percolate into the subjacent rocks. Were it not for this detaining influence the surface water would so rapidly run off the rocks that but little would be absorbed and the river-beds would be absolutely dry for the greater part of the year, having no percolated water to fall back upon to maintain their supply.

In South Africa, as in every other country, the upper slopes of the hills or koppies are practically bare of soil. This is more apparent in arid countries whose rainfall is of an intermittent and torrential character. The bases of the hills are the sites of a larger accumulation of detritus, or talus. This consists of rock fragments lying in some amount of decomposed rock constituents.

Hills formed by crust distortion, resulting in tilting of the rocks, have this talus slope more pronounced on one side than

the other—more on the side where the edges of the rocks are exposed than on that presenting the bedding plane of the strata. Horizontally bedded rocks retain their soil on those positions where rain and wind have least effect in removing the detritus. Usually further down the hill, where the slope becomes more gentle, the rock fragments diminish in size, while the disintegrated material predominates, constituting "soil." Hence we find at the foot of hills a soil (see fig. 16) composed of the products of the decomposition of the rocks composing the hill. These products have been described above for the country now under consideration.

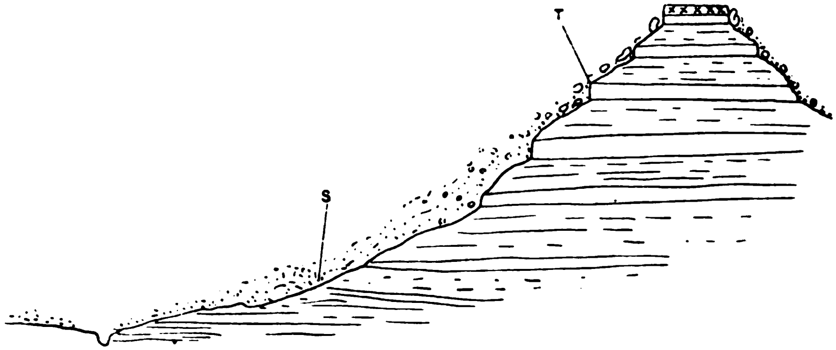


Fig. 16.—A hill of horizontal rocks, showing a talus slope. T, talus; S, soil.

There are other points in regard to this soil which must not be overlooked, as they form an important feature when arranging the disposition of camps, apart from the supply of drinking water.

Water falling on this soil runs down the slope in large part on the surface. Some is absorbed and descends until it reaches the underlying harder rock. Gravity produces a downward current in the absorbed water, which moves, though less rapidly than the surface water, towards the stream bed. Some of this absorbed or percolated water is taken up by the underlying rock, in proportion varying with the character of the rock, but not to any great extent until the valley level decreases the rapidity of the fall by gravitation, and so gives more time for the slower percolation into the harder rock.

Consequently we have during rainfall on these slopes a

superficial washing of the soil, and a deeper soakage of surface impurities into the soil, increasing in quantity from the upper part of the slope downwards, and all travelling towards the bottom of the valley. When the rainfall ceases the moisture remaining in the soil does not all travel downwards; a proportion is evaporated. As the superficial portion is evaporated some of that lower down travels up by capillary attraction, and is also evaporated. This action is lessened in those soils whose surface rapidly bakes hard. But whatever the character of the soil, the water which has been evaporated leaves behind it dissolved and suspended matters. The earth has been just sufficiently studied as a culture medium to show that pathogenic bacterial life may exist in it for a considerable time; so that when such a slope has been inhabited it must become impregnated with dangerous human excreta.

It is obvious, therefore, that the higher the camp is placed on such a slope, or above such a slope, the less is the chance of fouling of the site, because the soil is less, and because such soil as exists presents less surface above the camp from which percolation may take place, and travel down beneath the site of the camp. Equally obvious is the fact that all dumping grounds should be on a portion of the slope lower than the camp. It is so obvious that the observation would not be worth recording were it not that experience has shown that the obvious frequently escapes recognition.

The lower the ground, and the nearer the water-level to the surface, the greater is the prevalence of the mosquito. This fact is mentioned, as, though not strictly a physical one, it points an additional reason why low-lying ground should be avoided, especially alluvial flats. A temporary camp may be necessary in such a position, but a permanent camp should never be placed on such ground; for these flats must be looked upon as presenting aggravated examples of the evils indicated above of placing camps on localities where soakage of superficial impurities can find a lodgment. Such localities may become for strategic reasons unavoidable; such reasons are the only ones which will justify their occupation when other sites may be available. Draughty, liable to wide fluctuations of temperature, damp, their soil lending itself to the retention of impurities, alluvial flats are localities which should be avoided as camps.

Mineral Springs.—In certain parts of the country where the superficial rocks are composed of the older formations, mineral and thermal springs come to the surface. They appear to be resorted to chiefly for the treatment of rheumatism, a frequent disease of South Africa. So far as our Army was concerned, the best known of these springs was that at Warmbad in the Transvaal, and the following analyses made in June, 1901, of the waters there, furnished by Capt. (now Major) W. W. O. Beveridge, D.S.O., R.A.M.C., may prove of interest:—

Sodium chloride	8·64	grains	per gallon.
„ carbonate	12·28	„	„
„ sulphate	1·8	„	„
Potassium sulphate	0·30	„	„
Calcium carbonate	2·05	„	„
Magnesium sulphate	3·15	„	„
Peroxide of iron	0·35	„	„
Silica	1·05	„	„
Lithium carbonate	0·22	„	„

Their value in the treatment of rheumatism appears not to have been equal to the expectation formed from their local reputation.

The sulphur springs on the south-western side of Cape Colony appear to have some curative effect for the above complaint. An interesting point is related of those near the source of the Olifant's River, near Modderfontein, south of Clanwilliam, to which annual visits are paid by the Dutch farmers for bathing purposes. These people trek to the springs, encamp beside them, and bathe in the sulphuretted waters, which are collected in a pool for this purpose. In 1902, at the date of the annual visit, which coincided with the time of the Mont Pelée eruptions, the water of the springs at Olifant's River were found so hot that the visitors were unable to follow their usual practice of bathing.

Besides this *al fresco* watering place, other localities in South Africa have been resorted to by the colonists on account of their mineral and thermal baths, Malmesbury having recognised establishments for patients undergoing "cures."

The mineral wealth of South Africa has not been touched upon, as having no apparent bearing upon the medical aspect of the recent campaign; but as the supply of fuel may be an important consideration as an adjunct to sanitation, the position

of coal-bearing strata is of interest. Such strata have been worked in the Molteno District in Cape Colony, in the north of Natal, in the Orange River Colony, and the Transvaal near Vereeniging, between Klerksdorp and Potchefstroom ; along the Pretoria-Komati Poort Railway, at Ermelo and Vryheid. Deposits exist in Zululand and Basutoland; and further coal measures will be found in the Orange River Colony.

The coal of South Africa is the result of lacustrine deposits of carbonaceous material, and contains a considerable proportion of mud. It is found in the series of rocks shown in the table on p. 261, as Molteno, and is of Triassic age. Strata corresponding to the carboniferous of Britain have been found,* containing remains of plant life generically similar to those which produced our northern coal measures ; but coal measures of the Carboniferous period of geology have not been found in South Africa. The Zululand and some of the Natal coals are probably of an age corresponding to that when the Permo-Carboniferous flora of Vereeniging flourished. These coal-fields, however, do not appear to be of much economic value.

In conclusion, it may perhaps be stated that the practical outcome of this sketch is to show the necessity for drawing a broad line between water supplies having shallow or surface origins and those obtainable from deep sources. To obtain the former is comparatively easy, and on them will depend the immediate supply of a moving force. Such waters are almost certainly impure. To obtain water from deep sources requires that the force be supplied with boring apparatus and pumps. These apparatus are essential if garrisons are to be supplied with water from sources which are conveniently near, and which will ensure a supply bacteriologically as well as tactically safe.

This central question of water supply dominates mankind both in peace and war; its preservation is the ultimate objective of all sanitary measures.

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* A section of a specimen of silicified wood which forms an important fossil in the Molteno and Red Beds has been kindly made by Mr. A. Earland, of the Quellett Microscopical Club, and indicates the coniferous nature of the wood, the type of structure being Araucarian. It is similar to silicified wood (*Araucaryoxylon*), found by the French geologists in Madagascar, in strata resting against the central *massif*.

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THE "CURE" OF PHTHISIS.

By Capt. J. E. CARTER.
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I have ventured to choose this subject for my Essay for promotion, as it is a disease which I have had to fight in *Propriâ Personâ*, and have consequently obtained a certain practical experience of its modern treatment.

As this treatment is a comparatively new one, naturally much has been written on it recently, especially on its most salient factors, "fresh air and feeding"; and so I shall not linger long on these two subjects, but will devote the bulk of my remarks to other, perhaps minor, matters, which are not so generally brought to the front, and are perhaps in danger of being overlooked, details for the most part, but it is by attention to detail that the success or failure of this treatment depends.

Fresh Air.

It is needless for me to state that this is all important. However, it brings in one practical point; inside any building the maximum purity of the internal air can only equal that of the external air; therefore a consumptive must reside in a locality where the air is of maximum purity, and not liable to contamination; as it would be, for instance, in the vicinity of a manufacturing town.

In winter the dwelling should be warmed either by hot-water pipes or by closed stoves; open coal-burning grates should be tabooed, on account of the unavoidable dust occasioned—this being a point of considerable importance.

Feeding.

If one should enquire the *rationale* of the system of feeding as now practised in our sanatoria, he would, I think, always be answered, "that it not only repairs the ravages of this most wasting disease, but that it builds up the system to such a condition that it can resist, and later wage war on, and finally destroy, the tubercle bacillus and its toxins. Reduced to scientific terms, this must mean that it is held that by means of feeding (1) either substances are produced or multiplied in the

body which are antagonistic to the growth of the bacilli, or (2) that (according to Metschnikoff's phagocytosis theory) this condition is produced by the multiplication of the phagocytes, whose "*métier*" it is to prey on the bacilli.

The substances produced or multiplied (as in the first hypothesis) would, I take it, be of the nature of alexins and nucleins. This latter substance is a complex organic compound obtained from different varieties of animal cells, such as from the testes, the thyroid, &c.; it is also found in milk, eggs, &c., also in the blood serum, where it is probably due to the disintegration of the leucocytes. That this substance possesses bacteriocidal properties has been amply proved, and it seems reasonable to suppose that by a proper dietary its proportion in the body might be increased to such an extent as to enable it to successfully combat the tubercle bacillus. But I am not aware that such a dietary has ever been formulated, or carried into practice, excepting perhaps as regards milk (which is, of course, a large constituent of a consumption diet), though whether this is given for this specific purpose, apart from its other valuable properties, I am unable to say.

Whatever may be the scientific reason, there can be no doubt as to the benefits derived from feeding, or rather overfeeding, for as a rule the progress of the patient, even as regards the physical condition of his lungs, proceeds *pari passu* with the increase of his weight. This increase of weight, however, must be kept within limits, and a condition at all bordering on the "plethoric" must be carefully guarded against, and, in my own experience, I have seen much harm result from the reckless piling up of superfluous fat. Apart from immediate danger of hæmorrhage, the difficulty of keeping a patient who is loaded down with an excessive weight of adipose tissue in anything approaching a good condition of general health, which is the desideratum of open-air treatment, need only be mentioned to be appreciated.

Digestion.

Now, how do the digestive organs stand this system of feeding? We all can call to mind instances of a phthisical patient, one who has never left the family circle, whose appetite requires to be titivated by dainty dishes (so his female relatives

tell us); he cannot eat this, and he cannot eat that. Now, can such a patient put up with the system of feeding as in vogue at our sanatoria? Where certain food is placed before one, which one must eat willy-nilly, well, the answer is, almost invariably, yes. The digestive organs can and do adapt themselves to the food they receive, and in a little while become able to receive and assimilate (for it is assimilated) larger quantities of food than they have hitherto been able to deal with. And if this be doubted one need only refer to the medical officers who are in charge of the different sanatoria throughout the country. I do not mean to say that success will crown the first attempts of the patient, but he will find, to his astonishment, that he is able, after the first week or so, to deal with quantities of food which previously he would have considered out of the question.

Climate.

This is a very practical subject, and the question has to be answered daily, "Shall I send my patient to winter abroad, or let him be treated at home?"

Now I shall premise, that for the purposes of my essay, viz., the cure of consumption, I am only dealing with those cases which have a reasonable chance of becoming "cured," not with those chronic cases, where the question is of quite a different nature, *i.e.*, "Where shall I send my patient so that he may survive the winter?"

I think it is now acknowledged generally, that a particular climate is not an essential factor for successful treatment—I mean that cases have been found to recover in all or any climate. This subject is an extremely difficult one to handle, as it is so difficult to treat it on its own merits alone, to dis-associate it from other subjects, with which it is closely connected, these subjects being (1) the question of medical supervision; (2) of food; (3) of difficulties connected with transit. I think it would clear the ground best if I dealt with these three subjects in the first case now.

(1) As regards medical supervision, all will agree as to its paramount importance, a supervision continued until the patient is convalescent, and has learnt to lead a "rational life," in all its minutiæ. Little success can be hoped for from an occa-

sional visit from a medical man. This constant medical supervision constitutes the great benefit of going to a sanatorium, and all cases should, without exception, begin their treatment there, wherever else they may go to afterwards simply for the purpose of learning what is the proper life for them to lead.

Now, how does this all affect the question of climate? Anyone travelling abroad will meet many a case of phthisis which has been sent out from home to "winter abroad." Many of these unfortunates have been sent out without their eyes having been opened as to the gravity of their condition; often they never see a doctor at all, or at most for only a couple of times. An attempt generally is made to lead an open-air life, by sitting out in the sun, &c., for some hours of the day; still the long hours spent indoors in that awful atmosphere which pervades all Swiss hotels, quickly neutralises all the benefit obtained out of doors; skating, lugeing, dancing, theatricals, &c., are much in vogue, and in all of these amusements most of the phthisical patients join. What I wish to lay stress on is, the want of efficient medical supervision over patients, which is so apparent abroad. But it may be urged, that the medical supervision may be absolute, and just as efficient as at home. Granted, but such is the exception and not the rule, and in hotels, where practically all our patients reside, the temptation to do what one should not is always present under one's eye, and it requires a very level head to invariably turn away from it. As regards the Swiss sanatoria, a patient should not be sent there without the strictest investigations, as in most cases the name is only a synonym for hotel.

(2) Now, as regards food—this is another vital point. The feeding in Switzerland is generally very indifferent. Meat is tough and without nutriment. Vegetables are, as a rule, scanty, and the main constituents of a phthisical diet, milk and eggs, are indifferent or worse. This factor is generally overlooked by those who send their patients abroad, though why so important a subject should be so I cannot easily imagine.

(3) The journey from home must also be considered. The fatigue entailed is very considerable, and there can be no doubt that often serious mischief results directly due to this cause. Again, many health resorts in Switzerland can only be got at by

long sleigh journeys, such, for instance, at St. Moritz,* which is eight hours' sleigh from Davos; this, in my opinion, absolutely prohibits such places being chosen. I could easily bring forward cases to prove that this is no imaginary danger, but has even proved to be a fatal experiment.

Having now cleared the ground, let us consider the question of climate on its own merits. No one, I think, would be rash enough to say that our climate, all the year round, is a satisfactory one for the cure of phthisis. But all its advocates would point to their statistics, and reply, "Be it as you say or no, look at our results," and there can be no doubt that these results are convincing. Personally, I think that they are obtained by attention to those subjects I have just quitted, rather than to the effects of our climate.

To take our summer first. Provided one avoids a relaxing part of the country, or a locality shut in by surrounding hills, but chooses a residence preferably on the slope of some high ground, sufficiently sheltered from the prevailing winds, then I think that our home climate could not be readily exchanged for a better, and, when the very many advantages of living at home are added, the case for our home summer climate is overwhelming.

Now take the case of our winter climate, considered solely on its own merits. Well, I confess the brief is a hopeless one, and I can only throw it up. However, when we remember that remaining at home implies better food, and probably more careful medical supervision, then, I think, the case becomes a better one, and perhaps even a strong one.

I have it from the doctors of two distinct sanatoria at home that their cases do better in winter than in summer. I am inclined, however, to accept this statement *cum grano salis*, but at all events it shows that a case can be made out for our winter climate. One of the most serious defects of our winter climate is the prevalence of high winds; these constitute a positive danger to the patient, and nothing induces a hæmorrhage more readily than battling with a strong wind. A sheltered site, therefore, and sheltered walks, are imperative.

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* I understand that a railway is being laid to St. Moritz, and will probably be completed by next winter.

It is a matter of experience that the vicissitudes of our winter climate do not exert an injurious effect on the patients, nor is it found that they are more liable to catch a "catarrh." However, it must be admitted that the patients have by no means a rosy time during the winter, and one who has gone through the open-air treatment at home for one winter has little wish to repeat his experiences.

It is claimed that the great advantage of being "cured" in our own country is that when one is "cured" *there*, one can then pass the remainder of one's days at home, that it will not be necessary to fly the country every year with the approach of winter. This statement seems credible, and my own small experience bears it out. If true, it is certainly a very strong inducement to be treated at home. It is also stated that "cures," so called, effected at the Swiss high altitude resorts, though speedy, are not so resistant, and have a great tendency to recrudescence with the onset of winter. To my own knowledge many such instances have occurred.

Foreign Winter Resorts.

As regards foreign winter resorts, I think that we may at once rule out such places as the Canary Isles, Madeira, Riviera, &c., as being only suited to chronic cases who have abandoned all hope of cure, and whose object is to get through the winter as easily and comfortably as possible. No one now, I think, would advise a sea voyage (which used to be so commonly recommended), on account of its obvious disadvantage, including, especially, the difficulty of taking exercise. Nor do I think there is any great advantage in seeking treatment at the German sanatoria, such as Nordrach of Falkenstein, where the diet would be found to be very uncongenial, and the climate not very different from our own.

South Africa used to be a favourite rest-house for the consumptive, but now, with our increased knowledge and facilities of treatment, it can scarcely hold its place. Its great drawback is, of course, dust. However, for those who have overcome the disease, or where it has become quiescent, who are what is generally known as "cured," for all such my unhesitating advice would be, "Go to South Africa" and live your life there.

EGYPT.

As regards this country, the winter climate is simply perfect and leaves little or nothing to be desired. Its disadvantage, however, is that it is so much a society place; this makes it difficult even for the strong-willed to lead a proper life, and for the weak-kneed practically impossible. At Helouan one would probably have the best chance of success, or perhaps at Luxor, where a new and excellent hotel has just been opened, "The Savoy." "Menai House," Pyramids, is mainly run as a "so-called" sanatorium, and equipped with sun-traps, &c., but all things considered, I should hesitate to recommend it.

The disadvantage of Egypt is its expense, hotel living will alone amount to £1 a day, and in addition one has a long and expensive journey to and fro. All things considered, I would not recommend Egypt as a winter residence for a patient whose disease has not yet been arrested; it being so, however, I would accord Egypt a second place as a winter resort.

The winter climate of North California resembles that of Egypt, and in addition it does not suffer from dust to anything like the same extent. It is an ideal climate. However, the long journey there precludes it from being seriously considered by us in this country.

SWITZERLAND.

This now brings us to Switzerland, and, for the purposes of this essay, we have only to deal with places above the level of the winter snow-line, say, not below from 4,000 to 5,000 feet above the sea-level. These places should, I consider, only be visited as winter resorts, for whatever may be their advantages for a winter sojourn, I cannot see that they possess any for a summer residence, but, on the contrary, many and very grave disadvantages.

I venture to make this statement, although I have been informed by doctors resident at high altitude resorts that their patients do very well there during the summer. I must, however, query, "Would they not do better at home?" So I now find myself reduced to a discussion as to the relative advantages and disadvantages of wintering in Switzerland.

We have all either experienced or read of the typical winter day at a high altitude Swiss resort. I will content myself by

saying that all the praise that has been lavished on this subject falls far short of doing it justice. The mere beauty of the scene is enchanting, enthralling. The sun blazes down on one from a cloudless sky, driving one perchance to seek a momentary shelter from its rays, but not for long, however, for in the shade it is freezing hard. At night the cold is intense, every star is brilliant, and the mercury marks anything from 10° C. to 20° C. Not a breath of wind is astir, not a movement in the air to remind us of the cruel wind we have left at home. Awakening in the morning is a pure delight, after a night's rest, such as it is not possible to get elsewhere. You feel fit and eager to begin the day, nor does the feeling wear off as the day draws to a close, and you lay your head on the pillow again certain of another good night, and confident that a big stride has been made towards recovery. If this was all the story, if all other points were satisfactory, why, it were madness to stay at home for a winter, to run the risks and endure the hardships of open-air treatment at home.

But, alas, it is not so. Last winter I was in Davos for two months, February and March, fifty-six days in all, and of these eighteen alone were such days as I have described, on fourteen days we had sunshine in the forenoon only, ten days were overcast all the time, on seven days we had snow all day, and on seven days snow for half the day. I was told that I had hit on an exceptionally bad winter. Well, perhaps so.

I have already discussed the subjects of food and medical supervision; as regards the latter, if I might dare to make such a remark, I cannot help thinking that sufficient care is not exercised by physicians at home before sending their patients abroad. In some cases it would seem that the ungarnished statement, "Go, winter abroad," was considered advice enough, in so many instances did it appear that the patient considered himself to be there to play, and not to work at effecting his recovery. I am confident that advice given to a patient before leaving home by his tried and trusted physician would have much permanent effect, and perchance save many a life cast pitiably away either through ignorance or want of self-control on the part of the patient.

Effects of High Altitude.

The effect on the heart is very pronounced, and the pulse will be found to beat some fifteen to twenty beats faster than its normal; on even slight exertion the pulse will be found to be 100 or more, and this will be especially the case for the first few days after the arrival.

No case where the heart is at all affected should be sent to a high altitude. Such cases will find all their symptoms exaggerated, they will suffer from dizziness and fainting fits, nervousness and want of sleep, accompanied by derangement of the whole system, including their digestive organs, a complication most unfavourable for recovery.

The respirations are also affected, and become much deeper and quicker, especially at first. Both these conditions must be borne in mind and the patient enjoined to keep very quiet for the first few days, and to begin exercise very gradually.

Physicians opposed to high altitudes urge an increased tendency of hæmorrhage; however, those on the spot deny such increased danger, and from my own observations I could find no such tendency, and I am much inclined to doubt if any such exists.

Should a patient, then, be sent abroad?

As regards the summer, as I have already stated, let him be kept at home.

As regards the winter, if he is willing to pass it in a good sanatorium at home, by all means let him do so; and I think that the chances are, that in the spring his health will be sounder than if he had gone abroad and taken all the risk attendant on such a course.

I say "in a sanatorium" advisedly, for cases where satisfactory treatment can be carried on in a patient's home during the winter must be very exceptional. But if he will not go to a sanatorium at home, and presses to be sent abroad, may the physician's consent be given? Well, I think it may, provided that he has been under treatment for a length of time sufficient for him to be thoroughly acquainted with its *rationale*, to have learnt the hard lesson of knowing what things must be left undone by him and what few things may be done, and more especially have learnt to read and act on the indications given him by his thermometer.

All this knowledge, to my mind, can only be efficiently mastered at a sanatorium, where I think as a routine treatment every patient should be sent for a period of some months as soon as his disease is diagnosed.

Exercise.

Exercise is a subject on which there is some difference of opinion. I mean as regards the amount permitted. Its primary object is to bring the patient into a good state of general health and vigour, and afterwards to keep him in that condition; to assist all his different organs to do their allotted work, more especially his digestive organs. Nothing can attain this object as walking exercise can.

Most authorities push the amount of exercise, stopping short, of course, well within the limits of fatigue, as shown at once by an undue rise of temperature. Others reduce exercise to a minimum, only permitting their patients to take just sufficient to keep their organs in working order. This is practised at the Swiss high altitude resorts, where lying in long chairs is principally relied on, such resting being there technically termed "curing."

In our sanatoria the former plan is adopted. It is that introduced by Dr. Otto Walther, of Nordrach, and closely followed by us. He also advocated a modified hill-climbing, and has graduated paths, with a very gentle slope, cut in the hills behind his sanatorium. The results obtained by him seem to prove the benefit of this form of exercise. It has appeared to me that its success may depend on the complete aeration of the apices of the lungs, consequent on deep respiration. These diseased areas will then be flooded with their full complement of fresh air, and so accordingly benefit. For it is known that the air in the apices may be well nigh stagnant; and it is stated that it is by reason of this stagnation that the tubercle bacilli can make good their footing there, though not in other parts of the lung, where, of course, they must be much more frequently carried by the inspired air.

It is evident that no hard and fast law can be laid down as regards the amount of exercise permissible for every case. Each case must be a law unto itself. The unerring guide is the thermometer. The temperature should be taken immediately after the walk, and if it marks an undue rise, it is then con-

cluded that the fatigue has been too much for the patient, and that the length of the walk must be, for the present, curtailed.

The temperature chart attached will illustrate my meaning.* The second daily reading is the one in point, taken at 12 noon, immediately after the morning walk of about some four to five miles. The rise of temperature shown is "normal" for this patient, and probably exceeds little, if at all, the rise of temperature that would occur in a healthy man under the same conditions. The temperature taken some quarter of an hour later, after resting, will be found to have fallen to its usual height.

The following general rules refer to exercise. Until the patient has lost all trace of fever, no exercise is permissible. When he is free from fever, after passing through the successive stages of sitting up in his room or verandah, then sitting out of doors in the garden for a few days, he may then be permitted to crawl a few yards. If no undue rise of temperature results, the distance may be daily increased, though the rate of progress is for long kept extremely slow. Later, the length of walk will, of course, depend on his progress. A usual walk at a sanatorium is, say, from four to five miles, completed in about two and a half hours, with frequent rests during the walk.

Before the patient leaves the sanatorium, if he be a successful case, and about to resume his ordinary avocation, longer walks are allotted him, and the pace increased, so as to prepare him for the fatigues consequent on a return to ordinary life.

I have only to add that walking is the one and only form of exercise permissible for a consumptive. No form of arm exercise of any kind can be allowed, so much so, that the arms should be raised just as little as possible, the reason being to guard against any sudden strain on the chest wall, and consequently on the lungs and pleuræ, which would be extremely likely to rupture any pleuritic adhesion.

High winds are most dangerous for a consumptive, on account of the difficulty of drawing air down into the lungs, and the consequent violent straining on the chest. To take exercise in a high wind along an exposed walk is worse than folly, and is the most common of all causes of hæmorrhage. It is for this reason that the importance of shelter, and sheltered walk, is paramount.

(*To be continued.*)

* To appear with the continuation of this paper.

FIELD MEDICAL ORGANISATION—THE LESSONS OF THE WAR.

By Surg.-Gen. W. L. GUBBINS, M.V.O.
Army Medical Staff.

In the R.A.M.C. Journal for October, 1903, there appeared an article by Major Cottell giving the experiences of a Medical Officer in charge of an Infantry Battalion during the late war, and containing some admirable suggestions for improving the medical organisation of regimental units; may we hope that other officers, so many of whom are well qualified to do so, will favour us in the Journal at an early date with *their* experiences and views as regards such units as field, stationary and general hospitals, hospital trains, convalescent camps, &c., whilst events are comparatively fresh in their memory?

In these pages I will endeavour to give a kind of bird's-eye sketch from a P.M.O.'s point of view, although it cannot of course pretend to the accuracy and intimate knowledge possessed by the actual Commanding Officers of the medical units above alluded to. I may premise by stating that the following conclusions are based on an experience of nearly two years in South Africa, first as P.M.O. of an Infantry (the 6th) Division and the lines of communication in Orange River Colony, and secondly, in a similar capacity at Pretoria and the Northern District, including the Rustenberg, Rietfontein and Pietersberg commands, so that I had the great advantage of variety, both as regards conditions and locality.

In the official hand-books, viz., "War Establishments" (1898) and the "Field Service Manual Medical" (1899) we find, amongst others, the following units in the Field Army legislated for: (*a*) Staff units; (*b*) regimental units; (*c*) a bearer company; (*d*) a field hospital; (*e*) a stationary hospital; (*f*) a general hospital; (*g*) a hospital train; (*h*) a base depôt medical stores; (*i*) an advance depôt medical stores.

Leaving (*a*) staff units for the present, I will take the remainder *seriatim*.

(*b*) Regimental Units.

The medical establishment laid down for the above is one Medical Officer, one Lance-Corporal, and one Private; both the latter being found by the Corps.

The importance of the regimental Medical Officer cannot be over-estimated; it is to him the Commanding Officer must look to keep every man fit to take his place in the fighting line, and prevent drifting away to the field and general hospitals. I can bear personal testimony to the difference between a judicious and slack medical officer in this respect. Still keeping to *personnel*, we next come to the sixteen regimental stretcher bearers. The status of these men calls for early and *clear* definition; are they Red Cross men or are they not? Major Cottell (p. 301) suggests that they should be always at the disposal of the Medical Officer, meaning, I presume, that they should hand in their arms, &c., to the regiment and, wearing a brassard, be protected by the Geneva Convention. This, no doubt, would be the simplest plan, especially if the force were marching and fighting every day; but as the greater portion of the time of an army in the field (I am now alluding to major operations) is spent in a standing camp, I do not think any Commanding Officer would agree to, or be justified in, having sixteen lusty privates kicking their heels about, when every available man is required for picquets, guards and various other duties. Personally, I think the existing regulations are sound. As regards the use of S.B. armlets, these should be worn on the march in presence of the enemy, or during an action; their arms, however, should most certainly *not* be placed in the medical cart, but be taken over by the regimental authorities. When in action they must take their chance of being shot at like the Medical Officer and his orderly. The Geneva Convention does not recognise the neutrality of stretcher bearers, and, if captured, they are prisoners of war in every sense of the term.*

I will next deal with the Maltese cart. This vehicle was originally (I think in 1898) adopted as a compromise. It has the great drawback of being two-wheeled, but as a large number

* In the French Army the regimental stretcher bearers wear a dark blue brassard with a white Maltese cross.

of these were lying in store at Woolwich at the time, and as the expense of providing a typical medical cart was too great, it was considered better to utilise these pending the provision of a more suitable vehicle.

Owing to local transport difficulties in South Africa, many corps—especially dismounted ones—started the campaign without their Maltese carts, the medical stores, &c., being carried mixed up with other baggage; this caused the greatest inconvenience, so much so that on arrival at Bloemfontein the G.O.C. 6th Division authorised the purchase of light carts locally, which were marked and set aside as medical carts.

Briefly, then, I would make the following suggestions in this direction. A *four-wheeled* medical cart drawn by two horses should be designed and provided for each Cavalry regiment, Infantry battalion or equivalent, as is the custom in Continental armies;* in this should be carried the personal baggage (reduced to strictly service limits) of the Medical Officer and his two orderlies, also medical equipment and the eight stretchers on the line of march; to this I would add a couple of light tents, an antiseptic case (both suggested by Major Cottell), and above all one, if not two, medical comfort panniers. I emphasise these extra articles as, if provided therewith, the Medical Officer can—especially in standing camp—treat so many men for minor ailments instead of crowding up the field hospitals.

Before leaving the regimental units I must bear testimony to the supreme importance of the first field dressing and the identification tallies, especially the former. In the operations round Paardeberg, extending from February 16 to 27, 1900, their utility was demonstrated over and over again.

(*c*) Bearer Company and (*d*) Field Hospital.

I take these two units together, advisedly, as I think the time has long since come for their amalgamation; indeed, this change was discussed at the War Office as far back as 1899, but it was considered inexpedient on the eve of the war to make any radical change. Personally, I have never had any

* In the French Army the *voiture-medicale* is, for infantry and field artillery, two-wheeled with one horse; for cavalry and H.A., four-wheeled with *two* horses. In Germany, to the best of my recollection, it is of the latter type for all arms.

doubt on the matter, and the experience of the campaign has still further convinced me.

In February, 1902, a lecture* on this subject was delivered at the Royal United Service Institution by Staff-Sergt. Stapleton, London Companies R.A.M.C. (Vols.), and at its close an interesting discussion took place. The sense of the meeting was, I think, entirely in the direction of the amalgamation, and the arguments in its favour are so overwhelming that I only wonder why we did not copy the Indian Army and carry it out long ago. My suggestions towards this end are as follows :—

Have in future one unit to be styled a "field ambulance." In a standard dictionary (Murray's) the word *ambulance* is defined as "a moving hospital which follows an army in its movements, so as to afford the speediest possible succour to the wounded," therefore this term would be quite appropriate. This field ambulance to be capable of division into four sections, A, B, C, and D, as at present obtains in India. The unit to consist (exclusive of Transport Section) of 100 of all ranks, including eight Medical Officers and one Quarter-master. It will be observed that I have added one Medical Officer, and for the following reasons. On active service casualties are constantly occurring amongst the regimental M.O.'s, and the only convenient unit whence to replace them is the field ambulance; sick convoys to the rear have also to be thought of, so that the proposed numbers (eight) would not be at all too many.

On the other hand, the Warrant Officer and some of the N.C.O.'s might be reduced and employed elsewhere, the privates being correspondingly increased. The advantage of the unit being in sections, especially when a small portion has to be detached from the brigade, is so obvious that I need not enter further into it.

One such field ambulance should be allotted to each Infantry Brigade (strength 4,346), and to divisional and corps troops respectively; the Commanding Officer to be a Lieut.-Col. and to be *ex-officio* the Senior Medical Officer of the brigade. The second in command might also be a Lieut.-Col., or at least a senior Major, so as to replace him as S.M.O. in the event of disability.

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* Reported in *Journal of the Royal United Service Institution* for Dec., 1902.

In connection with this point I am altogether in favour of the Regimental Medical Officers being Captains or Lieutenants: it eventually came to this during the war. Seniors are out of place, or are wasted with regimental units, and the Principal Medical Officer, by constant visits, can do much to help the junior or inexperienced officer by his advice.

Other advantages of amalgamation are abolition of dual commands and the friction which constantly *does* exist, although the bearer company and field hospital companies may be excellent friends privately; simplification of returns and the allotment of the *personnel* to bearer and nursing duties in accordance with their various capacities. For a Cavalry Brigade (strength 2,497) half a field ambulance would suffice, owing not only to its relatively small numbers, but also the necessity of constant evacuation due to rapidity of movement.

The question of the revision of medical and ordnance equipment is too large for the scope of this article, but I would emphasise three points: (i.) The necessity of not losing sight of the *mobility* of a field ambulance, which is the essence of its utility. (ii.) The abolition of bell tents, which are most inconvenient, and the adoption of the tortoise or Canadian pattern—the latter for choice. (iii.) Suitable equipment, and above all ambulance waggons, specially adapted for the needs of Cavalry. Royal Horse Artillery, and Mounted Infantry.*

(e) Stationary Hospital.

I approach the consideration of this unit with a certain amount of doubt and hesitation. On leaving South Africa I was strongly in favour of abolishing it altogether both in the direction of simplicity and because the only stationary hospitals—three in all—that I had come across were practically general hospitals, except as regards the number of beds, which varied from 100 to 400. Since then, however, I have had the advantage of conversing with several officers who hold the opposite view, and who have given good reasons for retaining this unit in some shape or other, that I have now—I confess—an open mind on the subject, so will not dwell any further on it.

* In discussing this proposed unit, "Field Ambulance," could not the term "Collecting Station" be abolished? it is misleading. A dressing station only is necessary, and appears to meet all requirements in this direction.

(*f*) A General Hospital.

This is on the whole a convenient size (520 beds). I would be inclined, however, to raise the 20 beds for officers to 25, as experience has shown that the latter percentage is none too high.

As regards *personnel*, the Commanding Officer ought to be a Lieut.-Col.; there is no necessity that I can see for an officer of higher rank, especially as, I presume, charge pay will be continued on active service as in peace, under the new conditions. I would also suggest a reduction in the number of Medical Officers and R.A.M.C. *personnel*; an extra Quarter-master to be added, when required, making two in all; the nursing sisters to be largely increased, the existing establishment (nine) being ridiculously small.

As to *equipment*, I will only mention one item, viz., tents. The present hospital marquee is costly, an awkward shape, ill-ventilated, and stands the weather badly. On the other hand, the E.P. Indian tent stood well, and was generally liked; with improved ventilation it would be admirable. I have heard several officers dwell on the advantages—especially from the administrative point of view—of a tent of much larger dimensions, such as the ordnance store tent, which would take about twenty-six patients.

Burial of the Dead.

As the great majority of deaths—other than on the battlefield—occur in the general hospitals, this seems a convenient place to refer to this subject.

One of the most depressing things on active service—especially for the sick—is a funeral from a military hospital, and those who remember Bloemfontein in May and June, 1900, will, I think, bear me out. At Pretoria, when the general hospitals were definitely established the position was as follows: the Cemetery and the Artillery barracks, whence the funeral parties were furnished, are situated on the extreme west of the town;

Note.—The provision of milk for the hospitals is an all important one, but owing to the varied sources of supply and the strong probability of contamination, a collecting depôt where it can be sterilised and thence distributed is essential. One such was started in Pretoria very soon after the entry of our troops and with the best results.

whilst three out of the four general hospitals lay to the east, the fourth being in the town itself; consequently, for each funeral a detachment had to march over three miles from the barracks to the hospital, and the same distance back to the cemetery, often in very hot weather. On the matter being represented to the G.O.C. he at once authorised the erection of a small mortuary chapel, close to the cemetery, capable of holding twelve bodies; trestles were also provided to support the coffins. I am glad to say that this number was never even approached on any occasion. The remains were quietly removed from the several hospitals at 5 p.m. each evening, in a special covered waggon set aside for the purpose, and the funerals started from the chapel for the cemetery at 8 a.m. on the following day. Thus two objects were gained; the sick were spared seeing the funerals of their comrades, and the firing parties saved a long tramp and unnecessary exposure. I may add that this innovation worked with the greatest satisfaction, and I never knew any hitch occur.

(*g*) A Hospital Train.

The hospital trains did such splendid work throughout the campaign that their services—especially after the battles in Natal and on the Modder River in 1899—will not be readily forgotten; in fact, they saved the situation many a time right up to the finish. Those I was best acquainted with were the Princess Christian and No. 4 Hospital Trains, whose headquarters were latterly at Pretoria; both were painted white (with large red crosses) which was a distinct advantage. I have no doubt that the several Commanding Officers of these units could suggest further improvements both as regards *personnel* and *matériel*.

(*h*) Base and (*i*) Advance Depôts of Medical Stores.

The term *base* ought to be abolished, both as regards hospitals and medical stores; it is misleading. The old idea of keeping general hospitals at the base was completely exploded in South Africa; and as to medical stores, although two base depôts were established, one at Durban and the other at Cape Town, a so-called advance depôt was formed at Pretoria, which expanded in time to such proportions as to be equal to several

base depôts. This unit supplied not only the field army in the Transvaal, but also the civil hospitals and concentration camps performing really excellent service. The term "general depôt" would be more appropriate.

Setting aside the huge depôt formed at Pretoria, the utility of advance depôts was well illustrated at Bloemfontein, and, for a short time, at Kroonstad in 1900. Its position, however, must depend largely on the requirements of the field force and geographical considerations. To have a medical store depôt following a division, as the existing regulations would appear to imply, is, in practice, not workable. All medical depôts should be placed as near a railway station as possible; the gain in time, labour and transport cannot be over-estimated.

(*a*) Staff Units.

I have purposely left this until last. In the staff of an army corps, which is much the same as the staff of a field force, in addition to the P.M.O. we find ("Field Service Manual," p. 15) a secretary and an orderly officer, one of whom is to take medical charge of the staff. An officer acting in this latter capacity may be at once eliminated, and I think his proper place is on the personal staff of the G.O.C. In all our wars of any importance that I have read of, or been acquainted with, from the Mutiny down to South Africa, the G.O.C. has selected, and very naturally, his own medical attendant; it follows, then, that the latter can be of very little use to the P.M.O. Dual authority is always unsatisfactory, and in practice the arrangement is simply unworkable.

In any future expedition at all approaching the dimensions of the late war, I would suggest the following staff for P.M.O. of the force. A senior Lieut.-Col. as secretary, a Major as assistant secretary, a Captain or Lieut. as orderly officer. I lay particular stress on the secretary being a *senior* officer, in addition to his being very carefully selected; his chief must of necessity be frequently away, and it is only right that in his absence he should be ably represented.

Coming to the staff of an infantry division, the *personnel* is sufficient, but the allowance of one horse only to the P.M.O. is quite inadequate. Now if there is one individual, next to the G.O.C. himself, that ought to be always moving about, visiting regi-

mental and medical units, exercising a close sanitary supervision, it is the P.M.O. The A.A.G., D.A.A.G.'s and A.D.C.'s are each allowed three horses, whilst the P.M.O. gets only one. I do not for a moment wish to infer that any of these officers have too many, but I can assert from personal, and often painful, experience, that the P.M.O. should be allowed *at least* two horses.

During the operations in the Orange River Colony, had it not been for the kindness of the G.O.C. and various members of the staff in lending me a mount I would often have been in an awkward predicament. As far as I was personally concerned, this was subsequently rectified as a special measure.

Having now reviewed the various medical units hitherto officially recognised, there are a few others that the late war has brought into prominence worthy of notice, such as: (*k*) Nursing sisters' hospital; (*l*) convalescent camp; (*m*) railway rest hospital; (*n*) lunatic hospital; (*o*) isolation hospital; (*p*) native followers' hospital (when such are employed).

(*k*) Nursing Sisters' Hospital.

The necessity of this was early forced on me at Pretoria, where nearly 150 of these ladies were employed in the four general hospitals, hospital trains, &c. A detached bungalow well in the open was secured, and provision made for sixteen beds. This proved none too large an estimate, as at one period—during the unhealthy season—*all* were occupied.

To treat sick sisters in their own quarters, as I have heard suggested, is not only unfair to the other occupants. but radically unsound.

(*l*) Convalescent Camp.

Next to a general hospital, I am inclined to look on this institution as the most important, so much prominence did it obtain during the campaign. It deals with two classes; soldiers who find their way from the fighting force to the hospitals with nothing very definite the matter, but are utterly worn out, starved, often in rags, and only requiring good food and, above all, *rest* and *sleep*. Secondly, men discharged from hospital convalescent from wounds, or an illness of more or less severity, but who are not yet fit to rejoin their corps. For the

first class it is astonishing what a week or ten days' rest in a convalescent camp will do, and for the second it acts as a kind of half-way house between the hospital and the fighting force.

A permanent staff is necessary, to consist of one R.A.M.C. Officer (in command), one junior Medical Officer (if necessary), one Sergt.-Major, one Quarter-master Sergt.; one master cook* and such other *personnel* as may be required.

It is most essential that the Commanding Officer should be an R.A.M.C. officer; a man who lives with his charge, and by constantly moving about, gets to know the men, keeping everybody and everything under his own eye. By combining the Commanding and Medical Officer in one individual there is a saving of staff, and by holding one person responsible efficiency is secured. I can recall to mind one officer who had charge of the convalescent camp (600 beds) at Pretoria who was in every sense an ideal man for the post.

Tents—any pattern will do—sufficient to prevent overcrowding should be provided, and each man allowed an old mattress or palliasse. The ordinary rations† ought to be liberally supplemented by extras, such as soup, coffee, cocoa, eggs, fruit, &c., whilst an issue of rum occasionally, at the discretion of the Commanding Officer, will be found beneficial.

The question of reclothing men discharged from hospital, prior to rejoining their units or being invalided to England, assumed considerable importance, and as well as I remember several Army Orders (S.A.) were issued on the subject. The place to catch and equip these men is either in the general hospital or convalescent camp.

In one general hospital which expanded to 1,000 beds this assumed such proportions that it was necessary to add a second Quarter-master (*vide* remarks on this unit). I have heard the objection raised to this turning the medical branch into a clothing department, but on active service many new situations arise, and as long as we are given the *personnel* and means to carry out this service, we ought not to decline any labour that will secure efficiency to the fighting force and comfort to invalids proceeding to the base.

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* A most important individual.

† Mincing machines ought to be extensively provided.

To sum up, a well-organised convalescent camp is a powerful auxiliary to the G.O.C. in maintaining his force at efficient strength, and stopping the inevitable wastage that would otherwise occur. In a lesser degree convalescent homes are necessary for officers and nursing sisters.

(*m*) Railway Rest Hospital.

I was much struck during the long halt at Bloemfontein with the inconvenience caused by the absence of a hospital at or near the railway station, but I understood there were great difficulties in obtaining a building at all suitable. On reaching Pretoria in July, 1900, an excellent house within 100 yards of the railway station was placed at my disposal by the Military Governor, the Dutch family inhabiting it being accommodated elsewhere. It was completely furnished and ready for occupation in a week, twelve beds being provided. The staff consisted of one Medical Officer (who lived next door), one corporal, one cook and one orderly. I cannot say what a load of anxiety this little establishment took off my mind. Small convoys of sick and odd men were constantly arriving at uncertain hours by three different lines of rail, especially at night-time; all these were despatched forthwith by the railway staff officer on duty to the rest hospital, where they received refreshments and temporary medical aid, and were then passed on to the general hospital indicated for their reception. As a rule invalids arriving at night were kept until the following morning.

Putting aside the advantage of being able to promptly feed and succour hungry and worn-out soldiers, the saving in wear and tear of transport animals was great. Instead of ambulances being kept for hours waiting at the station for a sick convoy, which might arrive any moment from an hour to eight hours after the expected time, they were not despatched until the sick had actually arrived and were ready for removal, which was invariably done from the rest hospital, the mules were thereby fed regularly and kept their condition, whilst fouling of the ground in the vicinity of the railway station was avoided. During the first twelve months of its existence this unit afforded

Note.—*Infirmeries de gare* occupy in the French medical organisation a prominent place; they are managed by one of the Voluntary Aid Societies.

relief, of a more or less temporary nature, to over 300 officers and 5,000 N.C.O.'s and men.

(*n*) Lunatic Hospital.

In Pretoria, which was always a base for a force varying from 40,000 to 80,000 men, the necessity for a small establishment of this nature soon became apparent. The C.R.E. very promptly converted an isolated building into one suitable for the reception of mental cases. One or two wards should be reserved for officers, and the names of lunatic attendants of the corps noted in the P.M.O.'s office, so that their services can be secured at a moment's notice.

(*o*) Isolation Hospital.

At Pretoria almost every class of infection appeared at one time or another, rendering the provision of an isolation hospital imperatively necessary. A detached building in a breezy position was selected; about two acres of the ground immediately surrounding it was enclosed with a wire fence and E.P. Indian tents, as required, were erected. A steam disinfector (Thresh pattern) was located close to the building. Two old ambulance waggons—not strong enough for the veldt—were done up and painted bright red by the Ordnance Department; these were marked "I." and kept exclusively for the infectious cases.

In addition to the foregoing unit, observation, contact and isolation camps for possible cases of *plague* were formed, but these, happily, were never required.

(*p*) Native Followers' Hospital.

Two of these were found necessary, one for Indian, and the other for South African followers; for the former we had the great advantage of the services of members of the Indian Subordinate Medical Department.

In mentioning the foregoing units (*k*) to (*p*), for which no provision is made in war establishments, I merely bring them to notice as their necessity was forced on me at different stages as the war continued. As to whether it is expedient to lay down a *cadre* for them in time of peace is for others to decide; but what I do affirm, without any hesitation, is that no P.M.O. ought to take the field without bearing in his mind the possi-

bility of having to establish *at the shortest notice* some, or all, of those specified, and be prepared accordingly.

It is quite possible that this generation may never see a war of the extent or nature of that through which we have recently passed, and our next expedition may be fought out under totally different conditions. Speaking for the medical service, the various regulations, manuals, &c., bearing on war are, I take it, meant more as a *guide* and not as an absolute standard from which no deviation is to be made, and the P.M.O. and the senior officers under his command who do not adapt themselves to circumstances as they arise, abandon red tape and exercise ordinary common sense, will assuredly find themselves in difficulties sooner or later.

We are all much wiser men since that fateful October, 1899, when war was declared. Now that we have breathing time, let us profit by the lessons learnt in that war.

REPORT ON CHLOROFORM.

NOTE.—During the course of the South African war deaths under chloroform were reported from time to time. Although the proportion of these deaths was not excessive, there was a suspicion in one or two instances that the chloroform used had deteriorated owing to some subtle changes, the result perhaps of heat, climate and other conditions incidental to active service. It was thought these changes might have resulted in the formation of some unknown compounds which increased the the toxicity of the chloroform, and at the same time the risk of death during its administration. There was no doubt as to the original purity of the chloroform, as it was prepared from ethylic alcohol and was sent out in the original bottles bearing the name of one of the leading manufacturers of this article. A number of samples were obtained from South Africa and this country which had been kept various lengths of time, and had been exposed to variations of temperature and climate inseparable from active service conditions, including portions of the actual chloroform under the influence of which deaths had occurred or dangerous symptoms had developed.

These were all submitted to Dr. F. W. Tunnicliffe, Professor of Pharmacology in King's College, London, Assistant Physician to King's College Hospital, Examiner in Materia Medica in the Royal College of Physicians of London, &c., who undertook to make a complete pharmacological and chemical examination, and to furnish a report.

Through the courtesy of Dr. Tunnicliffe an additional sample in a sealed tin bottle, which had been returned from China with surplus stores from the China Field Force, was also examined.

A detailed account of the experiments conducted and the conclusions arrived at by Dr. Tunnicliffe are appended hereto, and they cannot fail to be of widespread interest to officers of the Royal Army Medical Corps serving in all parts of the world.—[EDITOR.]

Pharmacological Report upon Certain Samples of Chloroform submitted by the Secretary of State for War, together with Remarks upon the Effect of the Evaporation of Pure Chloroform upon the Toxicity of the Residue, by Dr. F. W. Tunnicliffe, Professor of Pharmacology, King's College, London.

The object to be ascertained by this research was whether any of the chloroforms submitted differed in their toxicity from the purest chloroform obtainable commercially. After careful consideration the method selected to answer this question was one which consisted in submitting a biological unit, especially susceptible to the action of chloroform, viz., the cardiac muscle, to the various chloroforms concerned, and in comparing in each case its behaviour under their influence to its behaviour under the influence of the purest chloroform obtainable. When we take into consideration the fact that in the case of the impugned chloroforms the heart was the organ attacked, this method suggested itself as being most appropriate. A difficulty at once manifest in this research arose from the exceedingly great susceptibility of the excised mammalian heart to this drug. In a communication recently published we showed that when one part of chloroform was added to 100,000 parts of the nutrient solution perfused through the heart, in certain hearts a graphically demonstrable alteration in the cardiac activity took place. When it is remembered that at least one part of chloroform in 10,000 parts of blood is required to produce complete anæsthesia in the human subject, it will be seen what a small margin exists in the case of chloroform, between the necessary quantity of the drug, and that quantity capable of producing a toxic effect upon the heart adequate to imperil life. Under these circumstances it is not to be wondered at that fatal syncope should occur from time to time in chloroform anæsthesias.

As it was essential in this research for the two chloroforms, viz., the pure chloroform and the chloroform under experiment, or the impugned chloroform, to be perfused through the same heart under so far as possible exactly the same conditions, the following method was adopted.

An excised rabbit's heart was prepared according to Langendorf's method, and was then perfused with an oxygenated sugar saline solution until the cardiac activity, as graphically recorded, was constant. A known quantity of the same solu-

tion, to which 1 part in 6,000 of the chloroform under experiment had been added, was next perfused, and the recording apparatus so arranged that the cardiac beats occurring under the influence of this chloroformed nutrient solution were recorded immediately under the normal cardiac beats. The change produced by the drug will be seen from the appended curves. (The quantity, 1 part of chloroform in 6,000 of nutrient solution, was chosen as being in accordance with analytical results of Pohl. The oxygenated sugar saline solution was identical with that used by Locke.) The same heart was then immediately perfused with a known quantity of unpoisoned nutrient solution until the cardiac beats had returned to the normal. These second normal beats were recorded immediately under the chloroform beats. The same heart was then in the third place perfused with a nutrient solution to which pure chloroform had been added in the proportion of 1 part in 6,000. The cardiac beats under the influence of this chloroformed nutrient solution were recorded immediately under those corresponding to the second perfusion with normal nutrient solution. Immediately subsequently to this last procedure the same heart was again perfused with normal nutrient solution until the beats had returned to the normal, and these last beats were recorded immediately under the last chloroform beats. A comparison was by this means established and graphically recorded between the influence upon the same heart of a given quantity of pure chloroform and the same quantity of the chloroform the pureness of which was under examination.

It will upon consideration be obvious that, since it was essential that the two chloroforms should be examined upon the same heart, the quantity of chloroform perfused had so to be adjusted, that while a definite pharmacological effect could be produced by it, yet nevertheless the heart must be left after its influence capable of complete restoration. In other words, that the subsequent perfusion of the second chloroform with which the first was to be compared must take place upon an uninjured heart. By a very large number of initial experiments I was able to convince myself that the most suitable quantity to be used for the purpose of these experiments was 15 c.c. of the chloroformed nutrient solution (1 in 6,000).

It may, of course, be objected to this method that, although

there might be no difference in the behaviour of the heart under the influence of pure chloroform, and under the influence of the same quantity of the impugned chloroform, when the above quantities of each were used, yet, nevertheless, had the action of both these chloroforms been continued, a difference in the toxicity of the two might have manifested itself. As a matter of fact this was not so; numerous control experiments were made in each case, and showed that the effect of each chloroform as represented towards the end of each graphic record remained constant for a considerable period. Moreover, with prolonged perfusion no difference between the two respective chloroforms could be demonstrated.

We do not purpose entering here any more fully into the technique of the experiments, but would refer you upon this subject to my preliminary communication upon the action of chloroform, ether, alcohol and acetone upon the excised mammalian heart made to the Physiological Society. I may, however, say that the chloroform was weighed for each experiment, that evaporation of it was prevented by the adoption of special precautions, and that the quantities said to be used may be regarded as gravimetrically accurate.

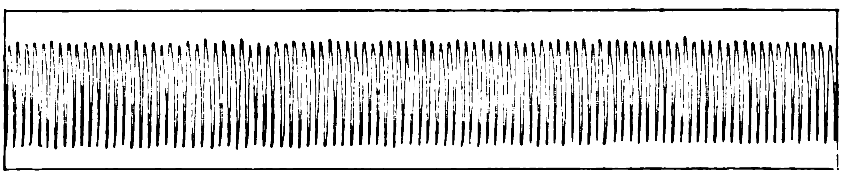
In all some hundred experiments were performed and graphic records taken. All the samples sent were not, however, examined, as this was not thought necessary. A number of chloroforms were examined chemically, according to the regulations of the B.P. The chloroforms examined may be divided into those which were supposed to be the cause of dangerous symptoms or death during the course of anæsthesia produced by them; those in the case of which considerable evaporation had taken place; those which had been submitted to exceptional transit; those derived from methylated spirit, and those of considerable age. In the case of these chloroforms numerous experiments were made with each sample, and graphic records of the experiments are contained in this report. In the case of the remaining chloroforms no graphic records are appended. The question of the effect of the artificial evaporation of pure chloroform upon the toxicity of the residue was also made the subject of a series of experiments, and the graphic record of a typical member of this series is contained in this report.

Before discussing directly the experiments which were made

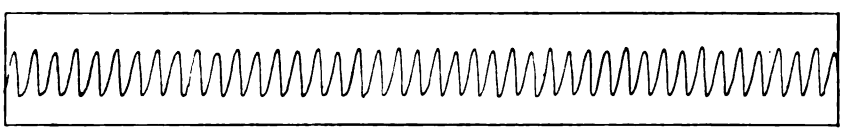
upon the samples of chloroforms submitted, it would be advantageous, as emphasising the high toxicity of chloroform upon the cardiac muscle, to briefly draw attention to the following experiment, which was made to determine the relative toxicity of chloroform, ether, alcohol and another allied body, acetone.

CURVE 1.—Showing the action of pure chloroform, pure ether, pure alcohol (B.P.) and acetone upon the rabbit's heart.

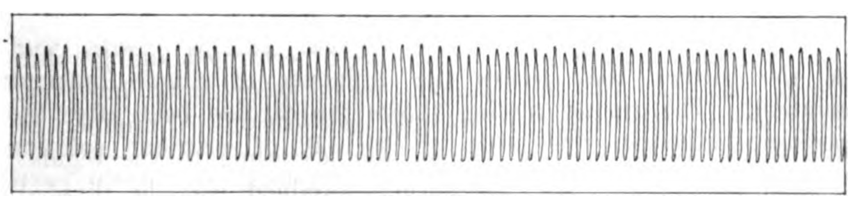
RABBIT'S HEART.—March 4, 1903. (Read from right to left.)



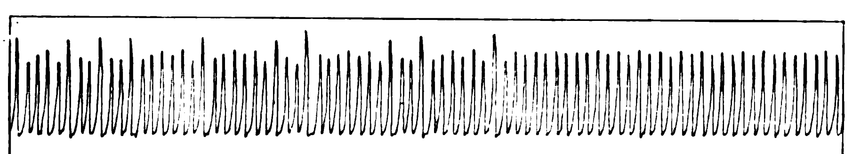
Normal (0·1 % Dextrose).



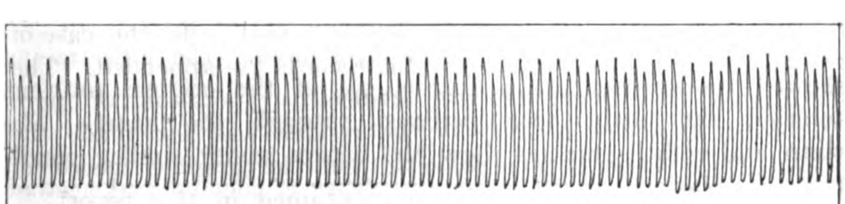
Chloroform 1 : 10,000. 85 c.c.



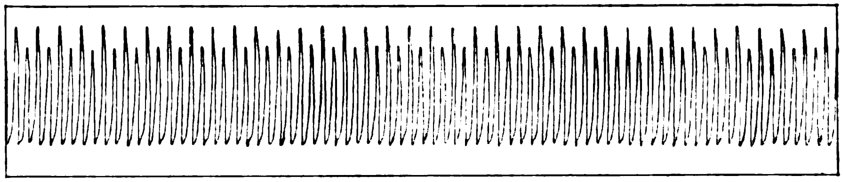
Normal. 85 c.c.



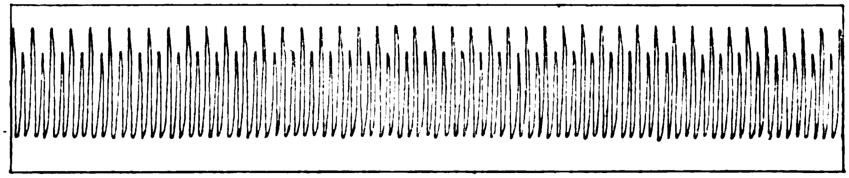
Ether 1 : 1,000. 40 c.c.



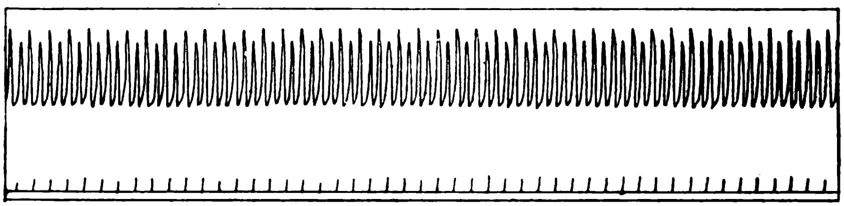
Normal. 50 c.c.



Alcohol 1 : 500. 40 cc.



Normal. 80 c.c.



Acetone 1 : 500. 50 c.c.

The first tracing shows the normal cardiac beats, that is, the cardiac beat under the influence of simple nutrient solution. The second tracing shows the cardiac beat after the perfusion through the heart of 35 c.c. of nutrient solution containing one part by weight of chloroform in 10,000 parts of the solution. This quantity is less than that required to produce anæsthesia. The third tracing, practically the same as the first, shows the cardiac beat after 35 c.c. of the original simple nutrient solution had been again perfused through the heart. The fourth tracing shows the cardiac beat after the perfusion of 40 c.c. of the original nutrient solution, to which one part by weight of ether in 1,000 had been added, or rather more than the amount required to be present in the circulating blood to produce ether anæsthesia. The fifth tracing showed the cardiac beats after 50 c.c. of the original nutrient solution had again been perfused through the heart. The sixth and eighth tracings show the action under similar conditions of relatively much larger quantities of alcohol and acetone respectively.

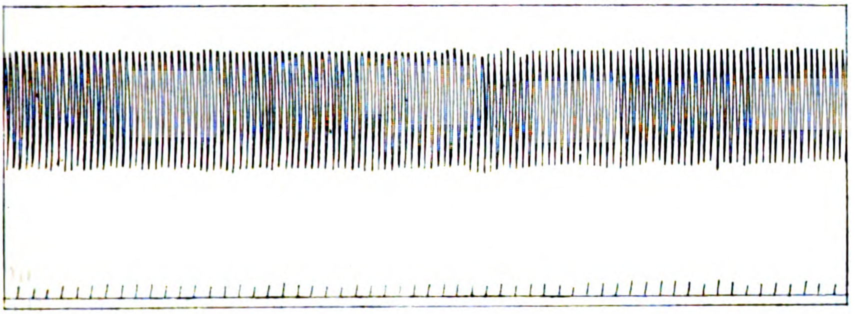
We now come to the results of the experiments made upon the chloroform submitted to us. The first series of chloroforms to be considered in this connection will be the one consisting of those during the anæsthesia produced by which either death or dangerous symptoms occurred.

The first sample to be examined was the chloroform used for the anæsthetisation of No. 4516 Pte. D., and numbered in the list 1.*

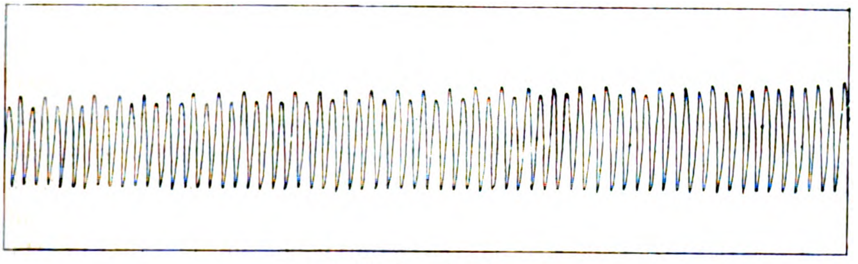
The next curve (Curve 2) relates to this chloroform.

Curve 2.—Comparison between the action of chloroform No. 1 and pure chloroform.

Rabbit's Heart.—June 18, 1903. (Read from right to left.)

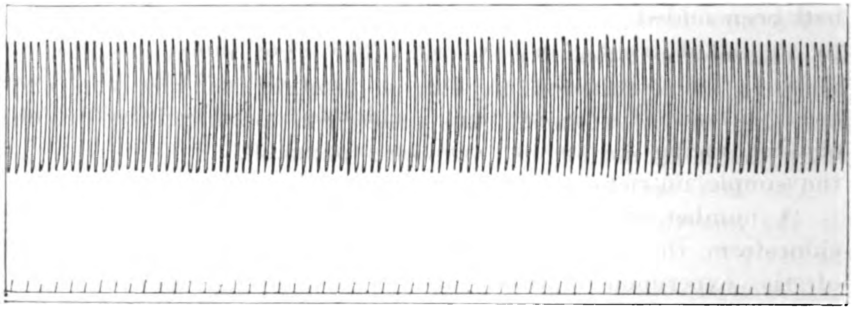


Normal.

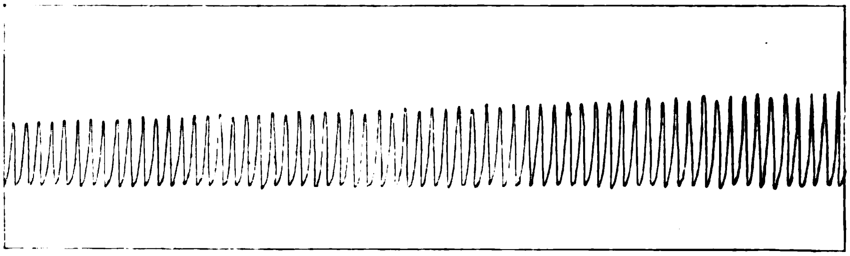


No. 1 chloroform 1 : 6,000. 15 c.c.

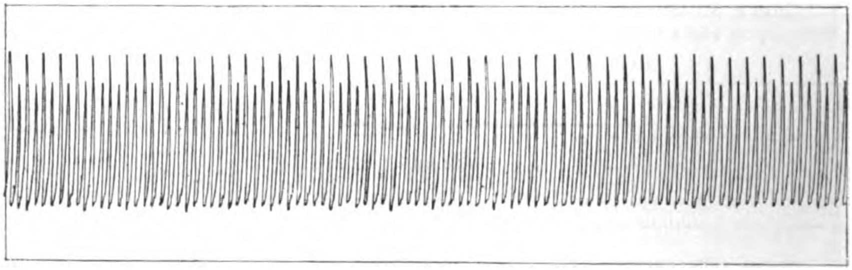
* Chloroform Pure, D. F. & Co., purchased January, 1900. Pte D., New Zealand Mounted Rifles, died under its influence on January 30, 1902, at No. 15 General Hospital, South Africa. Operation: extraction of teeth. Less than two drachms of chloroform was given.



Normal. 60 c.c.



Pure chloroform 1 : 6,000. 15 c.c.



Normal. 75 c.c.

The first line of the tracing is a record of the normal cardiac beat. The line immediately below this is a time-marker tracing, the space between each stroke indicating one second. The third line is the tracing of the cardiac beats under the influence of the nutrient solution containing 1 part in 6,000 of the impugned chloroform. The fourth line is the tracing of the cardiac beats during the second perfusion of unpoisoned nutrient solution, and shows an entire recovery of the heart. The next line of the curve is again the time-marker tracing. The sixth tracing is a record of the cardiac beats while the heart was being perfused with the original nutrient solution, to which 1 part in 6,000 of pure chloroform

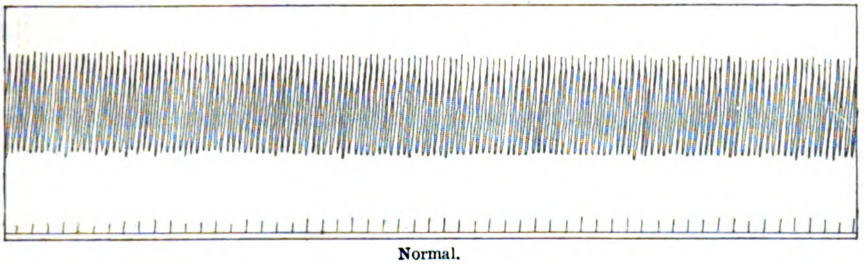
had been added. This tracing, therefore, is entirely comparable to the third tracing of the curve, the conditions under which it was produced differing only in that pure chloroform was used instead of the impugned chloroform. The seventh line of the tracing shows the cardiac beats under the influence of the simple nutrient solution.

A number of other experiments were made with this same chloroform, the results of which corresponded exactly with those of the experiment detailed above. We are therefore justified in drawing the conclusion that this chloroform, so far as its toxic action is concerned, differed in no demonstrable sense from that of the purest chloroform available, and that any symptoms which might have occurred during the administration of this chloroform were not due to any impurity in the chloroform.

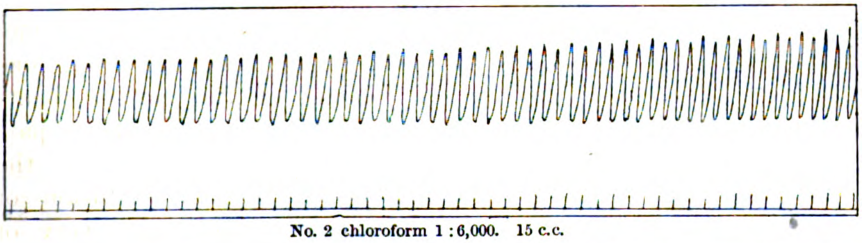
The next chloroform examined was No. 2, also a chloroform under the influence of which a death occurred.* The following curve (Curve 3) corresponds to one of the many experiments made with this chloroform.

CURVE 3.—Showing the effects of chloroform No. 2, and that of pure chloroform upon the excised heart, &c.

RABBIT'S HEART.—June 17, 1902. (Read from right to left.)

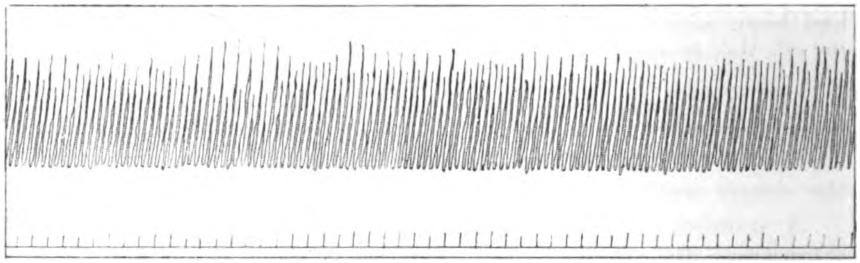


Normal.

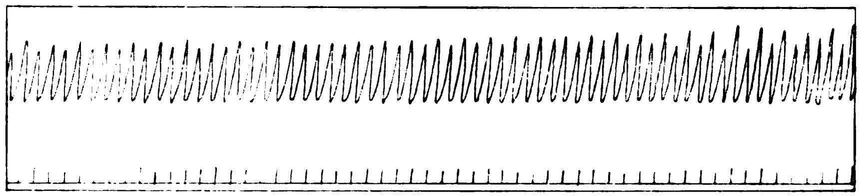


No. 2 chloroform 1 : 6,000. 15 c.c.

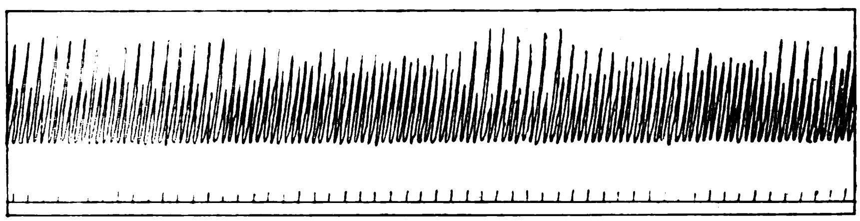
* Chloroform Pure, D. F. & Co., purchased January, 1900. Prisoner of War, C. J. M., died under its influence on January 27, 1902, at No. 18 General Hospital, South Africa. Another patient showed dangerous symptoms a few days before, when being anæsthetised by this sample.



Normal after 200 c.c.



Pure chloroform 1 : 6,000. 15 c.c.



Normal after 240 c.c.

A description of the above curve is hardly necessary, as the solutions perfused through the heart in each case are printed beneath the corresponding tracing, and the method adopted was precisely similar to that in the preceding curves. The heart used in this case was apparently a more irritable heart than usual, and did not return quite to the normal after either the War Office chloroform had been perfused through it, nor after similar treatment with pure chloroform.

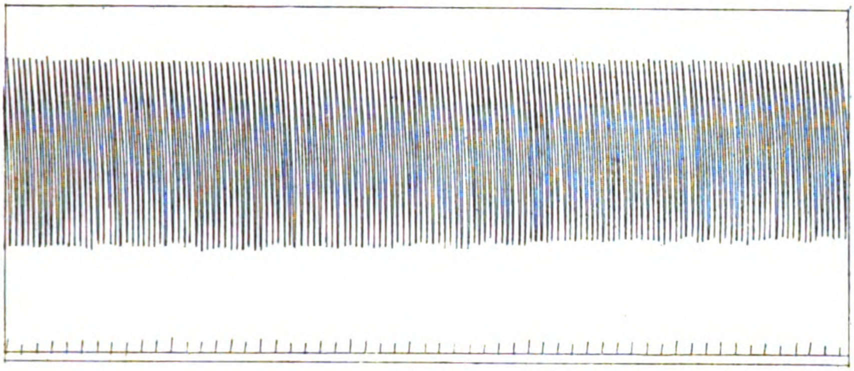
There was nevertheless no demonstrable difference either in this or other experiments between the action of these two chloroforms upon the heart. In other words, according to our experiment, this chloroform cannot be regarded as in any sense pharmacologically impure.

The next chloroform examined was No. 3, also an impugned chloroform, in that a death occurred during the anæsthesia pro-

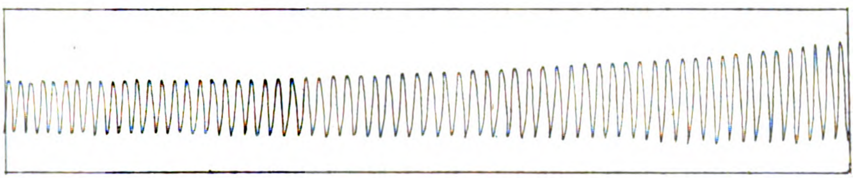
duced by it.* The following curve (Curve 4) shows the result of one of the many experiments made with this chloroform.

Curve 4.—Showing the effect of chloroform No. 3, and that of pure chloroform upon the excised heart, &c.

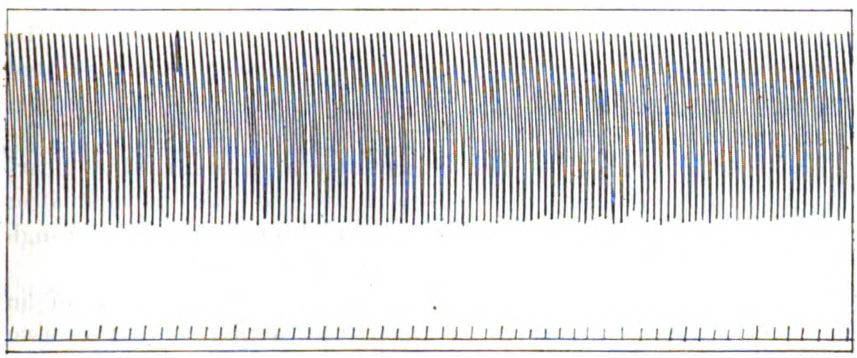
Rabbit's Heart.—June 19, 1903. (Read from right to left.)



Normal.

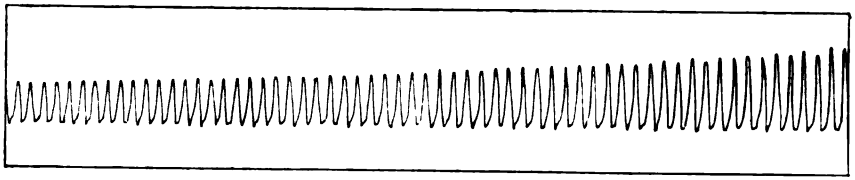


No. 3 chloroform 1 : 6,000. 20 c.c.

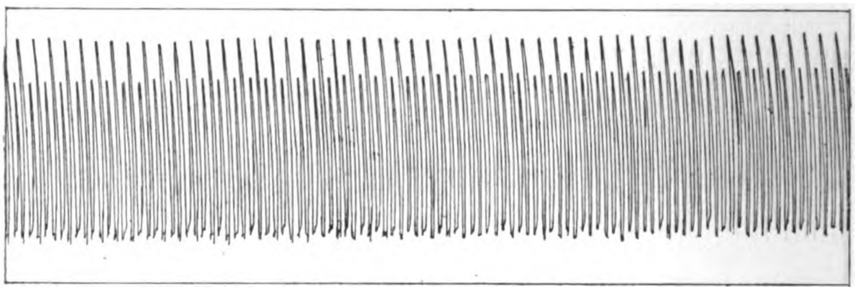


Normal. 50 c.c.

* Chloroform Pure, D. F. & Co., purchased December, 1900. Pte. T. N., 2nd Dragoons, died under its influence on February 10, 1902, at No. 2 General Hospital, South Africa. Operation: removal of fragments of bone from left foot—gun-shot wound. Half a drachm of chloroform was given.



Pure chloroform 1 : 6,000. 18 c.c.



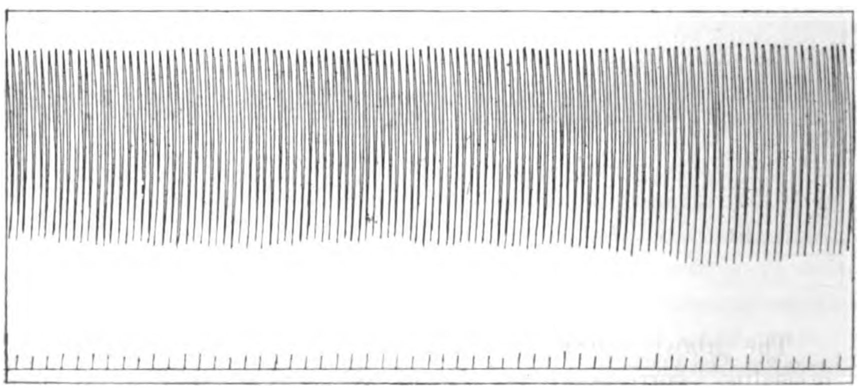
Normal. 60 c.c.

A detailed description of this curve is not necessary. The experiments clearly showed that no difference existed between this chloroform and the purest chloroform available.

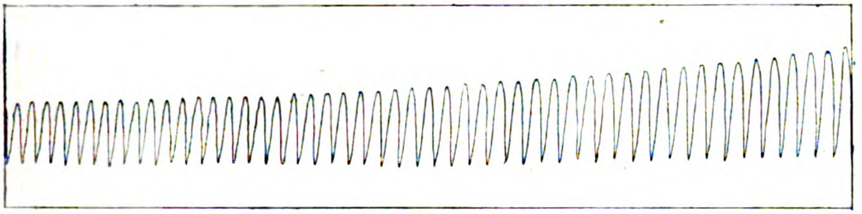
The next chloroform examined was No. 36. It is stated concerning this chloroform that it produced dangerous symptoms.

CURVE 5.—Showing the effect of chloroform No. 36, and that of pure chloroform upon the excised heart, &c.

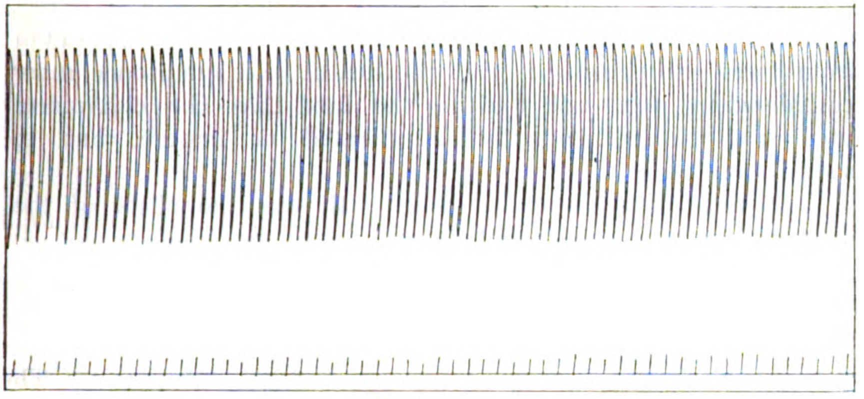
June 23, 1903. (Read from right to left.)



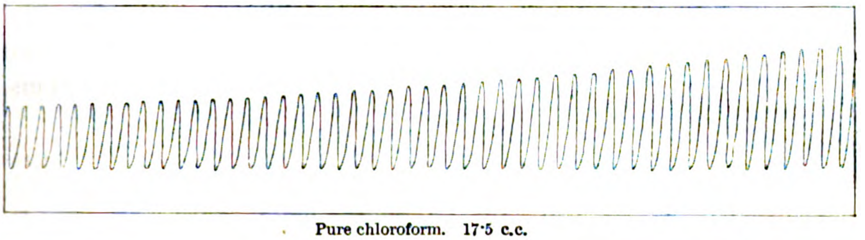
Normal.



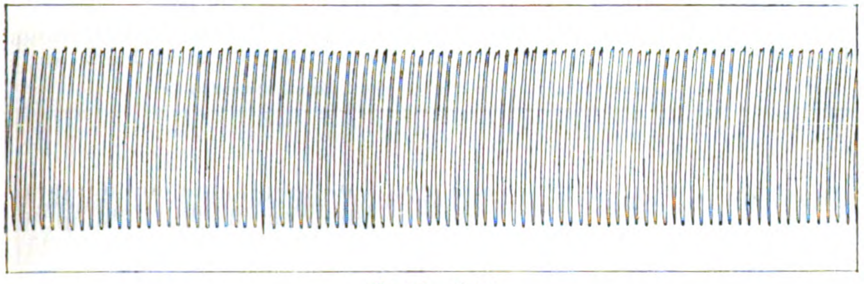
No. 36 chloroform 1 : 6,000. 21 c.c



Normal. 75 c.c.



Pure chloroform. 17·5 c.c.



Normal. 68 c.c.

The above curve, the same exactly in method as those preceding, corresponds to one of the many experiments made with chloroform No. 36. From the experiments made with

this chloroform and from the above curve we are justified in concluding that there is no difference in toxicity between this chloroform and the purest commercial chloroform available.

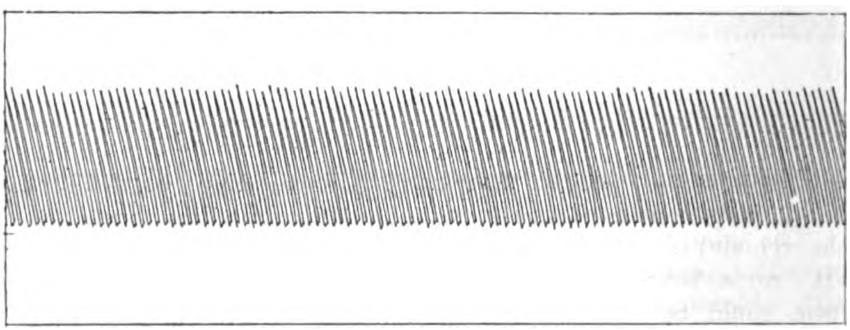
The examination of this last chloroform concludes the experimental examination of those chloroforms, during the anæsthesia produced by which dangerous or fatal symptoms occurred. There is no demonstrable difference between the toxic action upon the heart of these chloroforms and that of the purest chloroform available, and the only inference which we can draw from these experiments is that the deaths and symptoms under consideration were not due to the fact that the chloroform used was pharmacologically deteriorated or impure, but to some other cause.

The next question to be dealt with was the effect of the evaporation of a given chloroform upon the pharmacological purity of the residue. This question has been considered indirectly by the experiments already detailed, in so far as the chloroforms examined above had undergone partial evaporation. Apart from these last-mentioned chloroforms, however, certain others of the samples submitted showed this phenomenon. The samples referred to are Nos. 34, 35, 38, 39, 40, 47. These chloroforms were all examined in the manner already indicated, and no difference was found in their behaviour upon the mammalian heart and in that of the purest chloroform available.

From the numerous experiments made in this connection the curve corresponding to one of those made with No. 34 is appended below.

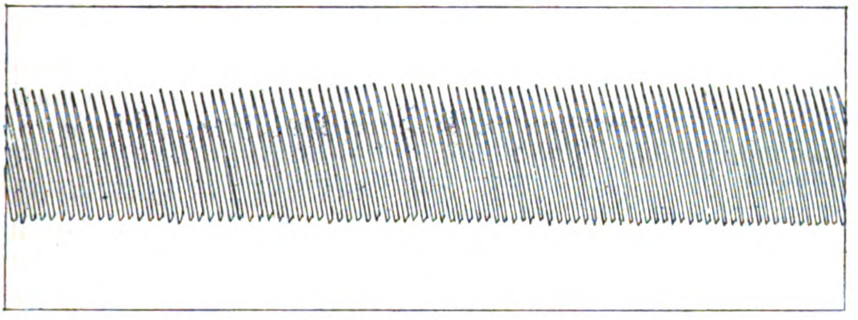
CURVE 6.—Showing the effect of the residue of a partially evaporated chloroform, No 34, and that of pure chloroform upon the excised heart, &c.

RABBIT'S HEART.—June 27, 1903. (Read from right to left.)

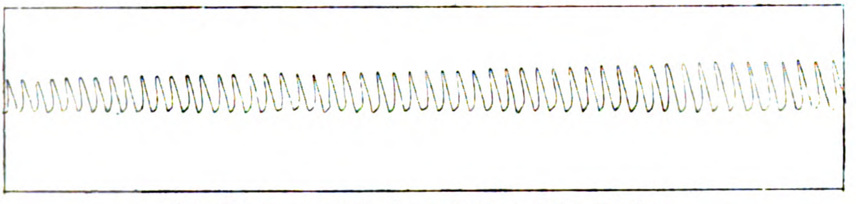


Normal.

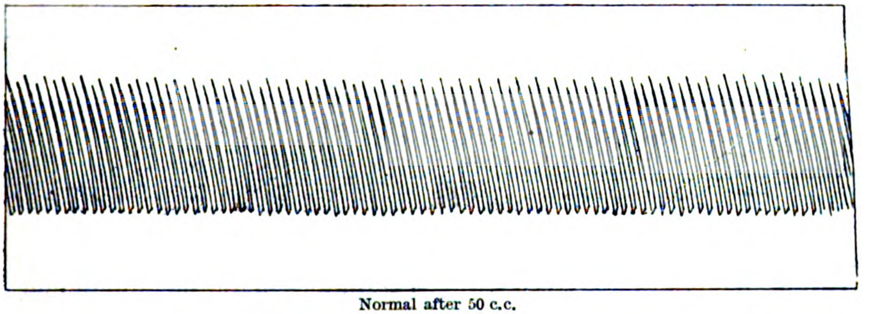
No. 84 chloroform 1 : 6,000. Begun after 5 c.c., ended after 16 c.c.



Normal after 40 c.c.



Pure chloroform 1 : 6,000. Began after 5 c.c., ended after 15 c.c.

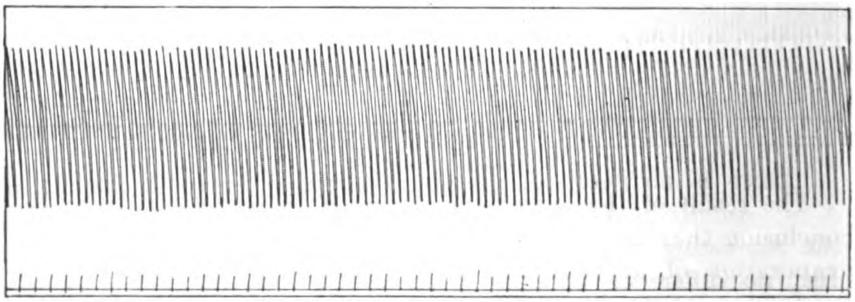


Normal after 50 c.c.

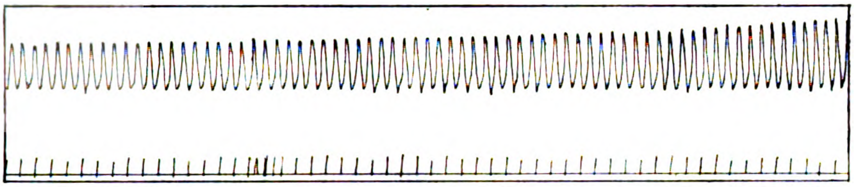
There is no need to describe the above curve in detail, as it is, *mutatis mutandis*, the same as the preceding ones. All the remaining chloroforms in this class gave the same results, viz., no difference between their action and the purest chloroform could be detected.

A question immediately related to the above, and one of extreme importance, is how the toxicity of an originally pure—measured by this standard—chloroform is affected by conditions likely to arise during military transit. Among these conditions may be mentioned shaking, exposure to sunlight and high temperature, such as might occur in warm climates. By an originally pure chloroform is meant a Duncan and Flockhart's or Macfarlane's chloroform, made from absolute alcohol, and rendered stable by the presence in the final product of a small quantity of absolute alcohol, as sanctioned by the B.P. In order to elucidate this question, a known quantity of a number of chloroforms of these types was subjected to the following manipulations. The sample was constantly—by a mechanical arrangement—shaken for several days. It was then exposed also for several days to a temperature varying from 0° C. to 4° C., subsequently it was exposed for several days to the direct July sunlight, and was finally allowed to evaporate to half its bulk: part of the evaporation occurring quickly, it being subjected to a low pressure; part of the evaporation occurring gradually, the chloroform being simply left in the open laboratory. After the chloroform had been thus treated it was examined similarly to the preceding chloroforms, and its effect upon the heart was compared to that of the chloroform from which it was originally derived. The following curve (Curve 7) shows the result of one of the numerous experiments of this class.

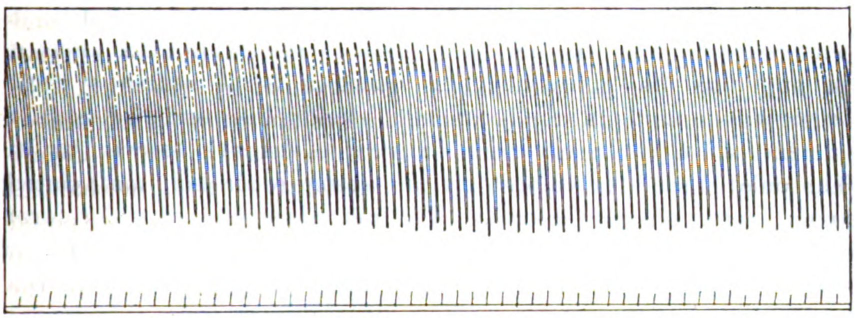
Curve 7.—Showing the effect of the residue, produced by evaporation by violent means, of a pure chloroform upon the mammalian heart, and the effect of the original pure chloroform upon the same heart.



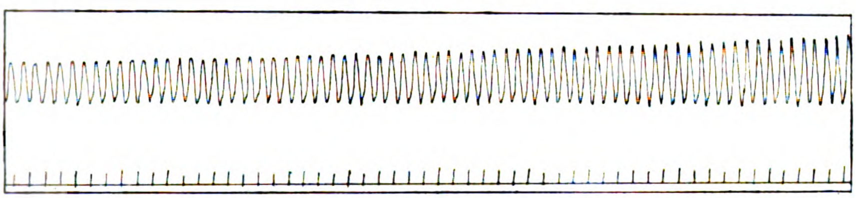
Normal.



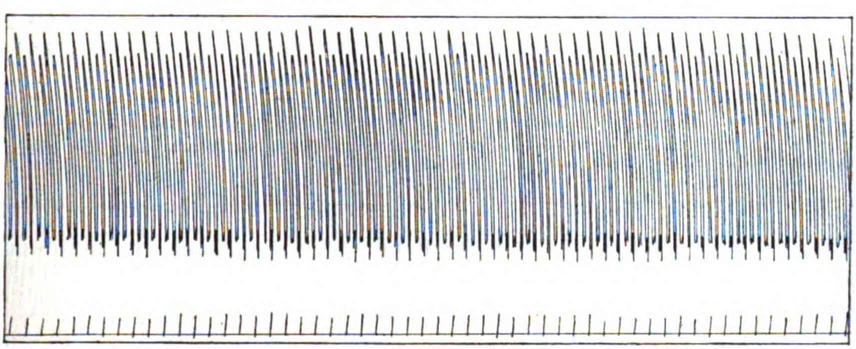
Evaporated chloroform 1 : 6,000. Begun after 5 c.c., ended after 13 c.c.



Normal nutrient. After 25 c.c.



Pure chloroform 1 : 6,000. Begun after 5 c.c., ended after 12 c.c.



Normal. After 25 c.c.

The result of this class of experiments seems to point to the conclusion that no ordinary physical conditions giving rise to the evaporation of an originally pure chloroform can so affect the residue as to make it more toxic than the originally pure chloroform itself. We do not think that any conditions likely

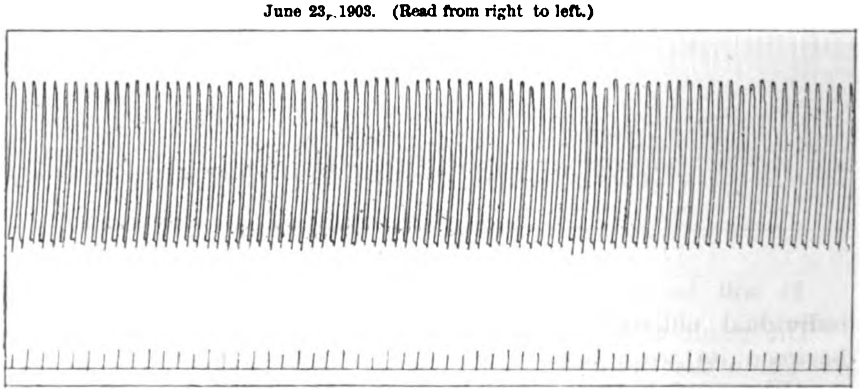
to occur in active warfare would be more violent than those to which these chloroforms were submitted in the laboratory, and we therefore feel justified in forming the conclusion that if an originally pure chloroform (B.P.) be treated with ordinary caution during transit, and even if some evaporation of it occur, the toxicity of the residue will not be different from that of the original chloroform.

The next point, which we considered somewhat cursorily in this research, was whether the source of the chloroform affected in any way its toxicity. This question is of course a most important one from the economic standpoint, and we cannot pretend at the present time to give a definite answer to it. The chief sources of chloroform are absolute alcohol, methylated spirit, acetone, and chloral. The official source of chloroform is not clearly defined, though the B.P. of 1894 states that it may be made from ethylic alcohol, and the B.P. of 1885 gave a recipe for its preparation. This subject crept into this report because one of the samples sent to be examined, viz., No. 17, is designated "Meth.," by which is almost certainly meant derived from methylated spirit.*

This chloroform, viz., No. 17, was made the object of several experiments. The following curve (Curve 8) gives the result of one of these experiments, and agrees with the results of the ohters.

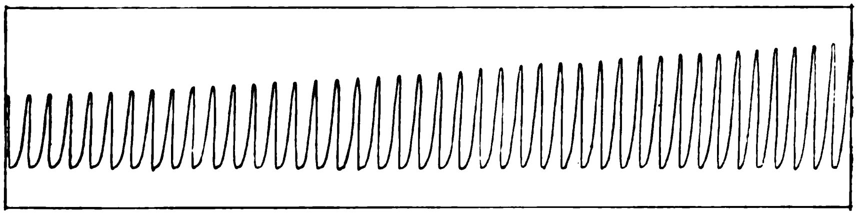
CURVE 8.—Showing the effect upon the mammalian heart of chloroform No. 17, apparently derived from methylated spirit, and that of pure chloroform.

June 23, 1903. (Read from right to left.)

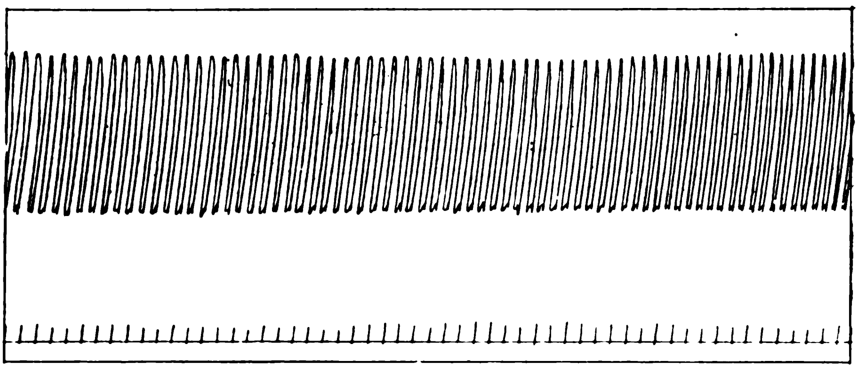


Normal.

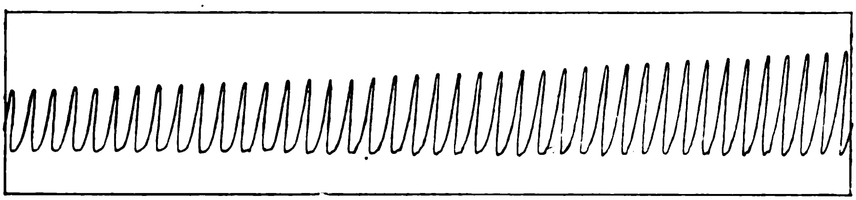
* This chloroform was obtained from a Home Hospital. It had not been issued for anæsthetic purposes.



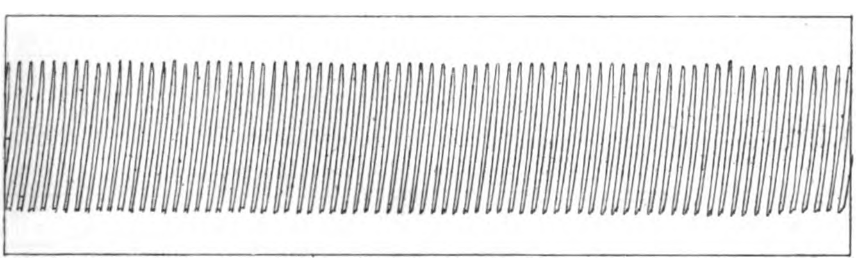
No. 17 chloroform (methylated) 1 : 6,000. 16 c.c.



Normal. 60 c.c.



Pure chloroform.



Normal. 50 c.c.

It will be seen from the above curve that so far as this individual chloroform was concerned there was no difference between its toxic action and that of pure chloroform.

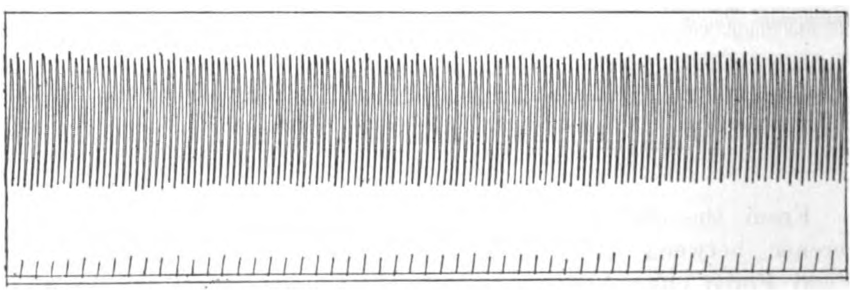
Other experiments were made with chloroforms from other sources derived from methylated spirit, and some samples were

obtained which showed a slight but appreciably increased toxic action upon the heart, as compared with pure chloroform. These chloroforms were, however, not prepared for anæsthetic purposes, and hence these results are not really germane to the subject in hand. An observation, however, communicated to us by one of the large manufacturers of chloroform, is of interest in this connection. It was to the effect that headache frequently occurred amongst the workmen while they were bottling chloroform made from methylated spirit, whereas these symptoms were not observed while manipulating chloroform derived from absolute alcohol.

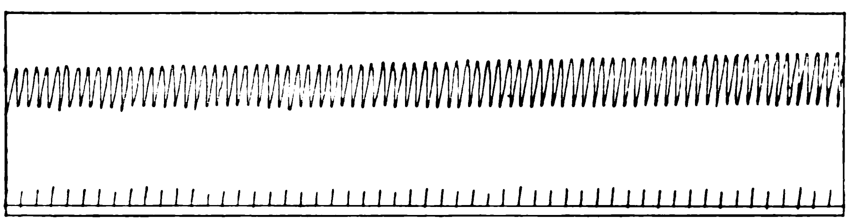
The next chloroform examined, and the last one concerning which we have thought it necessary to append the actual graphic results, was that termed Chinese Field Force chloroform. The sample of this chloroform sent was contained in a sealed tin. Chemically it conformed to the regulations of the B.P. This chloroform was examined pharmacologically upon several hearts in the way indicated above. The results of all the experiments made were identical. The following curve (Curve 9) corresponds to one of these experiments.

Curve 9.—Showing the effect upon the mammalian heart of Chinese Field Force chloroform and that of pure chloroform, &c.

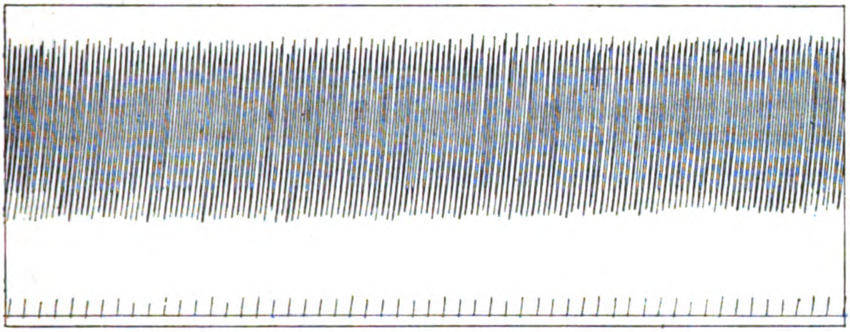
Rabbit's Heart.—July 18, 1908. (Read from right to left.)



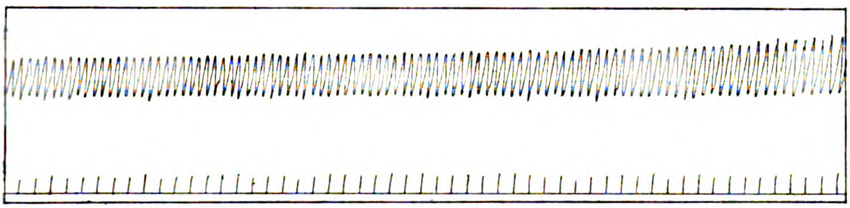
Normal.



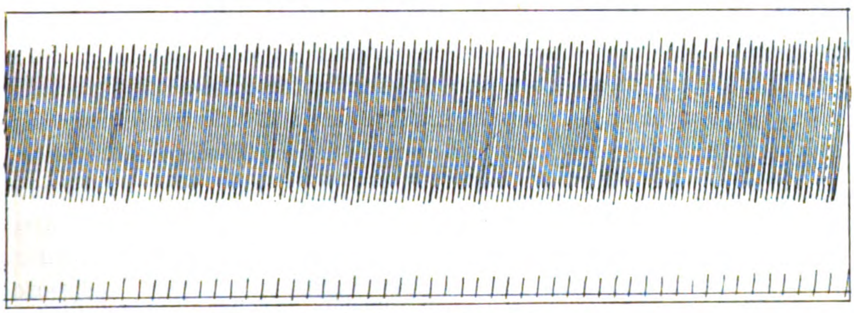
Chinese Field Force chloroform 1 : 6,000. Begun after 6 c.c., ended after 15 c.c.



Normal after 50 c.c.



Pure chloroform. Begun after 5 c.c., ended after 15 c.c.



Normal. 50 c.c.

From the above curve it is evident that there is no difference between these two chloroforms and that the Chinese Field Force chloroform is a perfectly sound chloroform.

The remaining chloroforms submitted for examination were collected from various sources, and were of various ages; all of them, or at any rate most of them, had been subjected to considerable transit. They differ, however, from those considered above in that there was no note with them to the effect that they had either undergone any evaporation or exhibited any properties distinguishing them in any way from ordinary chloroform. Forty of these chloroforms were examined

with precisely the same result as in the case of the other chloroforms, viz., that no difference could be detected between them and the purest chloroform available. One of them, No. 20, on account of its considerable age—viz., six years—was examined twice with the same result. The actual numbers examined were Nos. 5 to 33, Nos. 56 to 61 (date of purchase not known), No. 74 (date of purchase not known), Nos. 82 to 88.

It was not thought necessary to examine any further chloroforms.

Conclusions.

From the results obtained in the above research we are able to formulate the following conclusions :—

(1) No chloroform submitted to and examined by us differed in its toxic action upon the heart from pure chloroform.

(2) The residue of those chloroforms which had undergone partial evaporation did not differ in its toxic action from pure chloroform.

(3) The residues of pure chloroforms (B.P.) artificially evaporated in the laboratory by violent means did not differ in their toxic action from the original chloroform.

(4) From the last conclusion it may be inferred that pure chloroform containing a small per centage of absolute alcohol, as directed by the B.P., will remain free from pharmacological deterioration under the ordinary conditions of military transit. It would seem, however, advisable to keep chloroform during transit from exposure to strong light in closely stoppered bottles, and in as cool a place as possible. It must, however, be remembered in connection with these suggestions, that by no manipulations of the kind likely to be met with during military transit were we able to affect the toxicity of an originally pure chloroform.

Clinical Notes.

HYDATID CYSTS IN LUNGS AND HEART, SIMULATING PULMONARY TUBERCULOSIS.

By Col. R. H. QUILL.
Royal Army Medical Corps.

Pte. W. H., Royal Scots Fusiliers, aged 23, with two years' service, none foreign, was admitted to Fort Pitt Station Hospital, Chatham, on May 6, 1897, with symptoms pointing to phthisis pulmonalis.

The man stated he had felt quite well until some twelve months previously: about that time he had taken part in a race (marching order kit), and almost immediately afterwards commenced to suffer from cough, expectoration, and dyspnœa on exertion.

He had come under notice for the first time in March, 1897. He was then anæmic, with much cough and muco-purulent expectoration tinged with blood. He had lost flesh and strength, and there was a slight rise of temperature each evening. On auscultation the respiratory sounds generally were harsh, with tubular breathing over both apices. Finger ends markedly clubbed. Under treatment he improved. Blood disappeared from sputa, there was a distinct gain in weight, and at his own special request he was allowed to go on sick furlough for six weeks. On his return he again immediately reported sick, all his old disquieting symptoms, such as cough, muco-purulent expectoration, hæmoptysis, night sweats, loss of flesh, and evening rise of temperature having returned. Though there were so many suspicious subjective symptoms of phthisis pulmonalis, there was almost a complete absence of the physical signs of that disease.

Under the rest and comforts of hospital life he again improved, the cough and expectoration diminishing, but not the hæmoptysis. Body weight increased, the temperature was variable, and in a general sense he appeared to be doing fairly well. Quite suddenly one evening he was seized with intense dyspnœa; collapse rapidly followed, and death ensued in a few hours.

Post-mortem Examination.—Body emaciated to some extent.

Brain.—Beneath the dura mater on upper surface of brain, in the region of the Pacchionian bodies, was found a whitish deposit of little particles of the consistency of soft mortar. I am inclined to think that this mortar-like deposit was the remains of a small hydatid which has died early in its career.

Lungs.—Right: In its centre was found one hydatid cyst, the size

of a small orange; the lung tissue in the immediate neighbourhood of the cyst was highly congested. Many smaller cysts were distributed throughout the lung. *Left:* Twenty ounces in weight. Just below its apex on anterior aspect was found a large hydatid, the size of an orange. In other portions of the lung were three smaller cysts.

Heart.—Fourteen ounces in weight. Large *anti-mortem* clots in both ventricles. In the right ventricle, half an inch from the pulmonary valve, a large cyst with thick walls was found firmly attached by a species of pedicle to the cardiac muscle. Lying loose in the right ventricle were *ten* smaller cysts (daughter cysts), which possibly had been squeezed out of the parent cyst during the removal of the heart from the thorax. The sudden attack of dyspnœa which preceded death was probably caused by one of the daughter cysts blocking the pulmonary artery.

Liver.—Fifty-eight and a half ounces in weight. Quite healthy; no sign of any hydatid, which was odd, as the liver is a favourite viscus for hydatids.

Spleen.—Congested, very friable, otherwise normal.

Kidneys and Intestines.—Quite normal.

The rarity of hydatids being entertained by the heart has induced me to submit the foregoing remarkable example of hydatid infection to the readers of our Corps Journal.

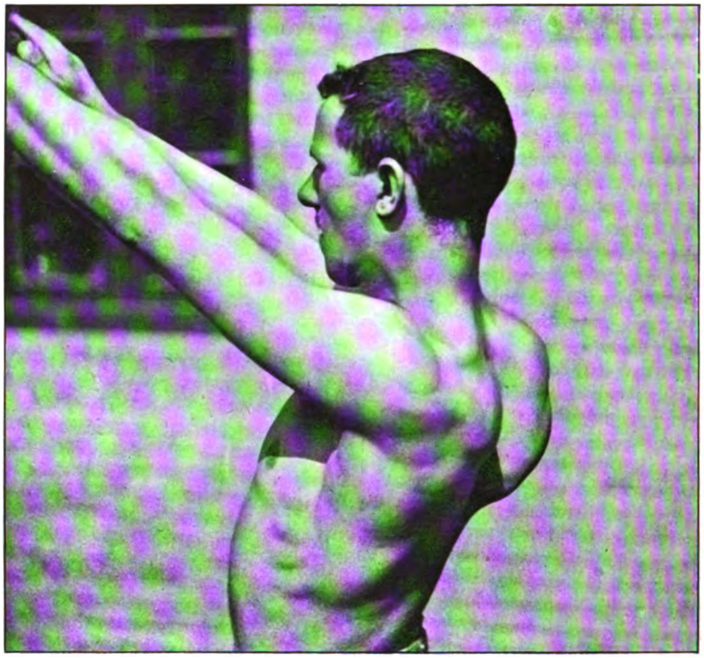
PARALYSIS OF POSTERIOR THORACIC NERVE, APPARENTLY THE DIRECT RESULT OF SMALL-POX.

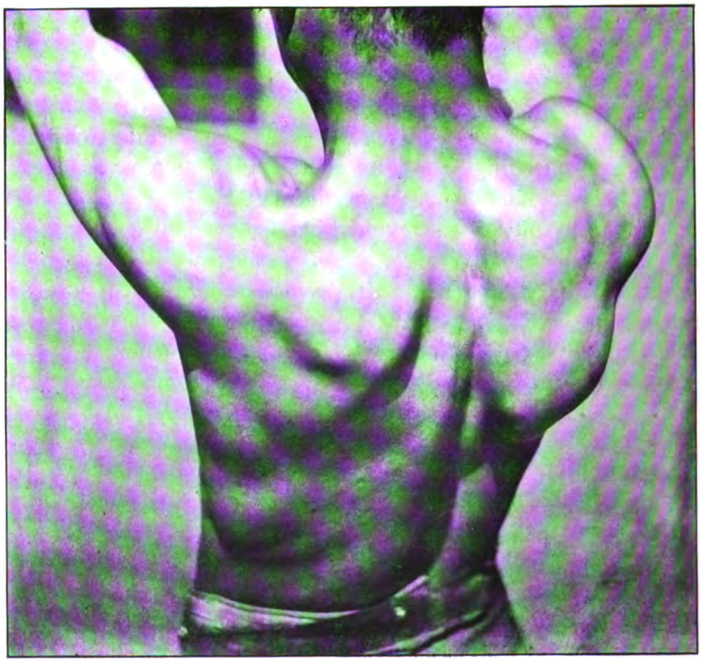
By Capt. F. E. GUNTER.
Royal Army Medical Corps.

Gunner A.—Peking Detachment, R.G.A., reported sick on March 19, 1903, complaining of inability to raise his right arm.

Previous History.—He was discharged from hospital, having recovered from a mild attack of small-pox, on January 16, 1903. A week after discharge he was doing "physical drill" and had to fall out owing to his inability to hold his carbine horizontally. Since then he has done so, but with difficulty.

On Examination.—Right shoulder droops, clavicle normal. Shoulder from front perfectly normal. The lower angle of scapula is rotated inwards and upwards, and is more prominent than the sound one. The vertebral border is nearer to the middle line than on sound side. He raises his arm with difficulty beyond the horizontal position, and as he does so the deformity becomes most marked. The supra-spinatus and infra-spinatus becomes very prominent, the scapula projects backwards, and the hand can be placed in the hollow between the scapula





and the ribs. The digitations of the serratus magnus cannot be seen on the right side.

Electrical Reactions.—These were kindly tested by Dr. Onimus, of the French International Hospital. No reaction with Faradic current; 5 miliampères, galvanic current, give normal reaction.

Treatment.—He is having galvanism daily and also massage; but I cannot say that there is at present any great improvement. The photographs are by Capt. Warren, R.G.A., his Commanding Officer.

AN UNUSUAL CAUSE OF DEATH IN MALARIA.

By Major H. A. HAINES.
Royal Army Medical Corps.

Last autumn, in the malarial season, a gunner of the Royal Garrison Artillery was admitted to Amritsar Garrison Hospital, from Fort Govindgarh, with a fairly mild attack of fever lasting but three days. He was, however, rather anæmic from previous attacks of the disease. He had had a normal temperature for some days, when he suddenly and unexpectedly vomited about two pints of dark blood. The ordinary remedies were exhibited with apparent success, and the patient kept in bed on a light diet and quinine grs. xx. per diem. The motions contained no blood; the patient had no fever, no splenic enlargement or abdominal tenderness, and he felt quite well for a day or so, when hæmatemesis recurred in rather smaller amount, but leaving him more anæmic. He was now put on calcium chloride, and was given nearly an ounce of gelatine in his food every day, besides ergot, acids, quinine, &c. For a few days all seemed well, when on turning over in bed he again had free bleeding. All food was then given *per rectum*, and bismuth by the mouth in 20-grain doses. He now had no colour in the face or lips, and it was evident that he could not stand the loss of much more blood, which proved to be the case, as he died after the next occurrence. The attacks had occurred approximately at intervals of seventy-two hours, suggestive of an alteration in the blood consequent on some phase in the life cycle of the parasite.

On making a *post-mortem* examination, the stomach was found filled with a large clot of blood forming a complete cast of the organ, and clots, in gradually altering and diminishing masses, were present all the way down the small intestine to almost the ileo-cæcal valve. The spleen was about the normal size and showed two large hæmorrhagic infarcts on the surface which had commenced to break down, and a third of smaller size and more recent formation.

After careful search for the point of origin of the bleeding in the stomach and intestines, a cavity five-eighths of an inch in diameter

was found about two inches from the cardiac end of stomach where the spleen was contiguous to that organ. This opened into the cavity of the stomach on one side by an orifice one quarter of an inch in diameter and communicated apparently with the splenic vessels on the other; unfortunately, the exact connection could not be verified as the spleen had been separated before we found the little opening, besides an atmospheric temperature of over 100° F. does not tend to stimulate pathological research in unlikely directions. I could find no connection with the gastric arteries or veins, and I doubt if aneurism would bleed in the manner above described.

It is evident that an opening into the stomach and ligation of the bleeding point might have saved this case, but as in the earlier bleedings treatment seemed to have controlled it, heroic measures were not thought of. After the later attacks the anæmia was so pronounced that it is very doubtful if the patient could have borne the shock of any surgical interference. Again, as every year in Amritsar several cases of malaria occur in malarial subjects and recover, it was thought that this was a similar case where a large surface was bleeding, probably in or near the duodenum.*

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* As bearing upon the subject of this paper, attention may be called to an interesting article on "Hæmatemesis in Pernicious Malaria," by F. T. B. Fest, in the *Journal of Tropical Medicine*, vol. vi., No. 4, February, 1903, p. 65, in which the author discusses five similar cases.—ED.

Editorial.

MALTA FEVER.

Historical.—This paper is written for the purpose of bringing up to date our knowledge of this fever. Its history, in relation to the Royal Army Medical Corps, may be briefly summed up as follows: The first paper of any importance was written in 1861 by Assistant Surg. J. A. Marston.[1] In it he described the fever from the clinical side very completely and clearly; and it will repay any one interested in the disease to read this paper. The next is by Surg.-Major Veale[2] in 1879, in which he describes cases of the fever invalided to Netley from Gibraltar, Malta and Cyprus. The next event of any importance was the discovery of the specific organism of the disease on July 9, 1887, and which was named *Micrococcus melitensis*.[3] Ten years afterwards, in 1897, Professor A. E. Wright and Surg.-Major Semple[4] applied the method of serum diagnosis to this fever, and this has greatly helped the working out and differentiation of it from enteric, malarial and other acute specific fevers. In this year also the late Surg.-Capt. M. Louis Hughes[5] published his book, of 219 pages, on Mediterranean, Malta or Undulant Fever, which contains everything known on the subject up to that date, and also a full bibliography.

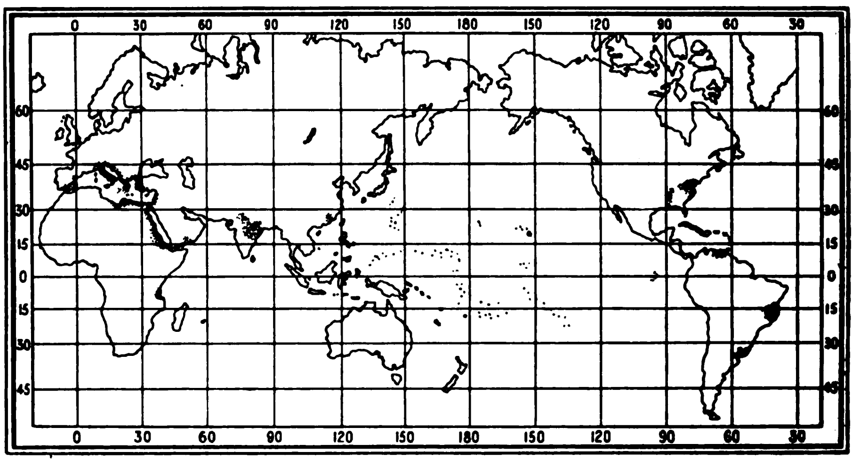
Geographical Distribution.—The following map shows roughly the distribution of this fever, as known up to the present time.

Doubtless further knowledge will greatly extend this distribution. For example: when we were in Kimberley, in South Africa, in 1901, we were shown a case of fever which from the temperature chart and history looked remarkably like Malta fever. As the case was convalescent, we could do no more, but we would be greatly obliged if one of our officers at Kimberley would take the matter up. It was owing to the kindness of Dr. Watkins, Kimberley, that we saw the case. The disease is known in Kimberley as camp fever.

During life the agglutination test is useful, if it is not possible to obtain a splenic puncture. If a death occurs, the planting out of the splenic pulp on agar-agar would probably

show whether the *Micrococcus melitensis* is present or not, and this, of course, would be the most satisfactory kind of diagnosis.

This fever has been reported from *Spain* — Gibraltar; *Islands of the Mediterranean*—Balearic Islands, Corsica, Sardinia Sicily, Malta, Gozo, Cyprus, Crete; *Italy*—Rome, Naples, Caserta, Benevento, Campobosso, Aricca, Terano, Fermo, Padua, Cittanova, &c.; *Greece*—Athens, Cephalonia; *Turkey*—Constantinople, Smyrna; *Palestine*—Jerusalem; *Africa*—Tunis, Algiers, Alexandra, Suakin, Massowah, Zanzibar, Kimberley (?); Aden; *India* — Calcutta, Mian-Mir, Nowshera, Secunderabad, Simla, Delhi, Agra, Allahabad, Choabattia, Subatha, Assam, Swat Valley; *China*—Hong Kong; Phillipine Islands; Fiji Islands; *North America*—Mississippi Valley; *West Indies*—Cuba, Puerto Rico; *South America*—Venezuela, Brazil, Montevideo.



Map showing the Geographical Distribution of Malta Fever.

The fever has even been reported as occurring in England. A man, aged 26, had not been abroad since the age of 8 years. From March, 1897, till the end of September of the same year, he was resident physician in a hospital in Plymouth. On October 1, he assumed the duties of junior house physician in the out-patient department at St. Bartholomew's Hospital, London, where he was employed during the whole of that month. He first began to feel ill in the beginning of November, and from the symptoms of the case it was at the time concluded

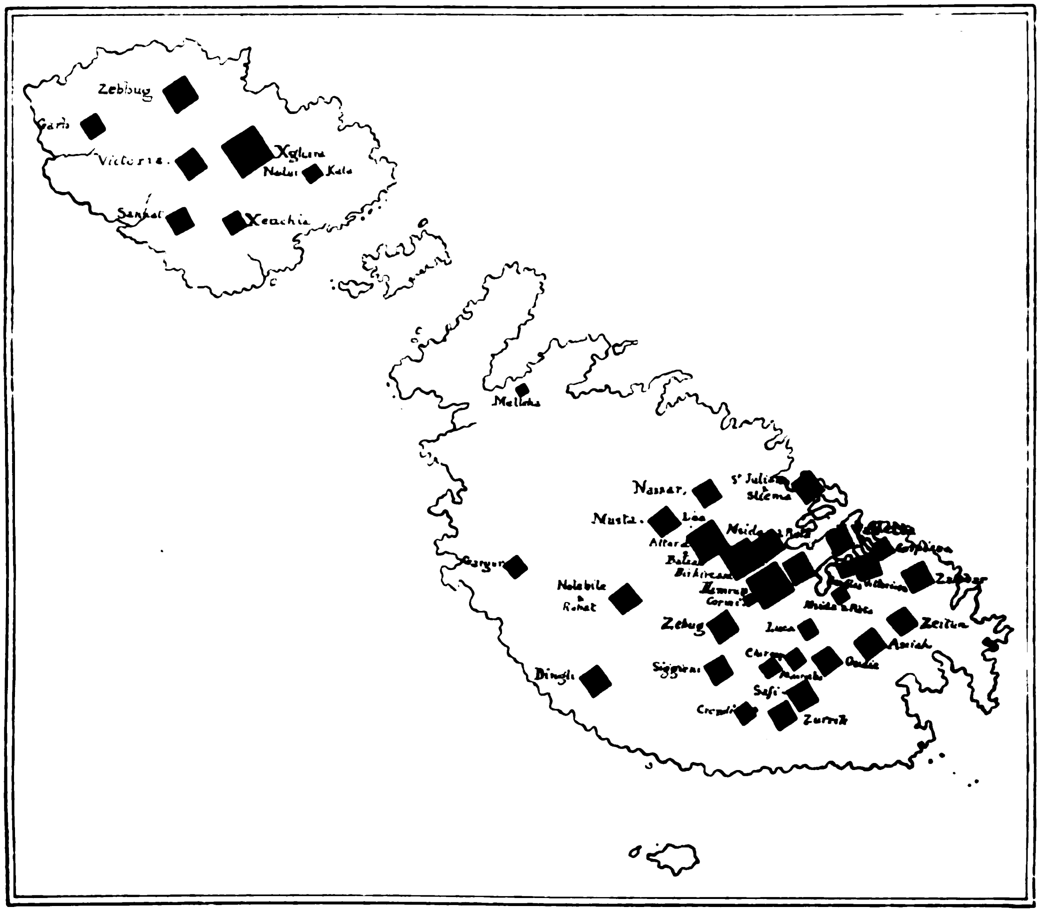
that this was a case of Malta fever, contracted either at Plymouth or London, although no definite source of infection could be traced.

Hughes, in the *British Medical Journal*, September, 1899, says that the limitation of the endemic prevalence of Malta fever appears to be primarily a question of temperature, and that in Europe to the north of the annual isotherm, 55° F., only imported cases are seen, which do not become endemic foci.

Distribution in Malta.—It will be useful now to enquire more strictly into the distribution of Malta fever as it occurs in Malta. For this purpose a map has been compiled from a paper read by Dr. T. Zammit before the Malta Archæological and Scientific Society, on May 23, 1902. In this paper he gives the following table, giving the average population, and average annual number of cases of Malta fever in the various towns and villages per thousand of the population for ten years, 1892-1901.

	Average population 1892-1901	Yearly number of cases of Mediterranean fever ‰ of population average of the ten years 1892-1901		Average population 1892-1901	Yearly number of cases of Mediterranean fever ‰ of population average of the ten years 1892-1901
MALTA.			MALTA—*continued.*		
Valletta	23,283	3·08	Tarxien and Paola ..	4,054	1·43
Floriana	6,131	4·88	Zurrik	3,521	3·20
Msida and Pietà ..	3,467	5·33	Safi	333	3·60
Sliema and St. Julian's	9,691	5·26	Crendi	1,287	2·40
Hamrun	8,257	8·21	Mcabba	1,156	1·90
Cospicua	12,106	2·39	Chircop	606	2·31
Vittoriosa	6,497	3·50	Zeitun	7,080	3·03
Senglea	7,331	1·42	Zabbar	5,347	4·78
Notabile and Rabat ..	7,455	4·11	Asciak	1,469	3·67
Dingli	709	3·66	Gudia	1,149	3·13
Zebbug	5,379	4·38			
Siggieui	3,118	3·30	GOZO.		
Birkircara	7,867	6·68	Victoria	5,088	3·87
Lia, Attard and Balzan	4,418	7·98	Gharb	1,360	2·57
Naxxar	3,457	2·63	Zebbug	862	4·98
Musta	4,443	4·32	Sannat	1,070	2·15
Gargur	1,332	1·80	Xghara	2,456	8·63
Melleha	2,106	0·71	Xeuchia	1,675	2·39
Cormi	7,801	0·47	Nadur and Kala ..	3,991	1·42
Luca	2,941	2·14	Ghainsielem	1,070	0·93

The following map represents this distribution by means of squares, whose size is proportional to the number of cases per thousand occurring in each town and village.



Map of Malta and Gozo, showing the Distribution of Malta Fever in the various Towns and Villages of the two Islands.

This is an interesting map and shows that our old ideas regarding the comparative absence of Malta fever from the inland parts of the Island and of Gozo were false. The disease is seen to be as prevalent in the country villages as in the big cities. We used to think that the neighbourhood of the Grand Harbour was the hot-bed of the disease, but the map

shows that the disease is more prevalent in such inland towns as Birkircara and Hamrun in Malta, and Xghara in Gozo, than even in Valetta or the three cities.

But perhaps it would be useful to describe at this point the physical characters of Malta, the towns and villages, the populations, the water supply, and methods of sewage disposal. This description is taken from a paper written in 1888, but which is probably as true at the present day as it was then.

"Malta, the principal island of a small group called the Maltese Islands, which comprises Malta, Gozo and Comino, is situated 50 miles south of Sicily, which can easily be seen on a clear day, and 200 miles east of the African mainland." Malta is a small island, being only 17 miles long and 9 miles broad. It is separated from the neighbouring island of Gozo by a narrow strait, 4 miles wide, in which lies the islet of Comino.

The island is built up altogether of sedimentary rocks, which have been divided by various geologists into upper and lower limestones and various intermediate beds of sandstone. These beds of sandstone are mostly formed of a very porous stone, and are traversed by innumerable fissures. Between the sandstones and the upper limestone there is a bed of marl which plays an important function in regard to the water supply of Malta. The eastern half of the island, and by far the most populous part, has been denuded of the upper limestone and marl, so that almost all the cities and villages of Malta are built on a porous sandstone. A microscopical examination of the rocks shows that the upper and lower limestones are composed of corallines, calcareous algæ and large foraminifera; whereas the so-called sandstones are made up of pelagic foraminifera, resembling in many respects, and to a very large extent, deep sea deposits.

Malta is one of the most densely populated places in the world. According to Dr. Cousins, the able author of the last census, which was taken some twenty years ago, the proportion of the population, exclusive of His Majesty's troops, is 144,312 to the square mile. Nearly one-half of this population (67,000) is concentrated, as might be expected, in the vicinity of the magnificent harbour, called the Grand Harbour, the shipping of which affords employment to thousands of the poorer inhabitants of the neighbouring cities and villages.

Valetta, the capital of Malta, is situated upon a tongue of land which forms the western boundary of the Grand Harbour and separates it from the Marsamuscetto or Quarantine Harbour. In its vicinity, near the base of the tongue, is its suburb, Floriana. On the other side of the Grand Harbour are the dense centres of population known as the three cities. Two of these, namely, Senglia and Vittoriosa, are also situated upon tongues of land which run into the Grand Harbour at right angles to the peninsula, upon which Valetta and Floriana are built. At the base of these two cities, but separated by a small intervening space, is situated the third of the fortified cities, namely Cospicua. Valetta is a handsomely built city, and to a stranger passing through appears to be very clean, but the houses are badly constructed, being lofty and built round narrow, well-like courts, down which little sunlight and pure air can struggle. The area of Valetta is only one-third of a square mile, and into this narrow space are crowded some 25,000 persons, the proportion of its population being therefore more than 78,000 to the square mile. If the area covered by the numerous sparsely populated buildings, such as the palace, the club, and the very numerous churches, was deducted, this proportion would be found to be much greater.

The most densely populated part of Valetta is called the Manderaggio. This quarter, inhabited by a very poor class of people, principally boatmen, is situated close to the Marsamuscetto Harbour, and only some few (fourteen) feet above the level of the sea. It covers two and a half acres, upon which dwell 2,544 persons, giving a proportion of 636,000 to the square mile. Another densely populated and low-lying quarter is that of Strada Fontana, which lies in a deep hollow behind the fortifications. It is also inhabited by the very poorest class.

Floriana, the suburb of Valetta, is a small, regularly built town. It has a population of 7,000, and is even more crowded than Valetta, the average number of persons to each inhabited dwelling being 10·44, whereas the average number in Valetta is 6·60; but it must be borne in mind that Floriana is situated in an isolated and healthy position.

The three fortified cities may be described together, and in a few words. The buildings are similar in structure to those of

Valetta, but are inhabited by a poorer class of people. Senglia and Vittoriosa are both built upon high ridges with steep sides. Cospicua, of the three, is the most huddled together, overcrowded, and has the poorest class of population.

Let us now direct our attention for a few minutes to the country villages or casals of Malta. These may be divided into two sets, viz., those lying towards the eastern end of the island, and those lying between Valetta and Notabile, the ancient capital. The villages lying to the east are inhabited by the least civilised of the Maltese, and in truth these people may be described as semi-barbarians. Let me attempt a description of their dwellings. Just outside the fortifications which surround the three cities lies the village of Zabbar, and a short distance further on the village of Zeitun. These may be taken as typical villages of the eastern set. In these two casals the construction of the houses is very different from that which obtains in Valetta and the three cities. Let us begin with the unit or building inhabited by one family. The plan is very simple, and was probably devised for motives of safety, when the island was apt to be overrun by any piratical crew. There is first built a square enclosure of the surrounding sandstone. The size of this enclosure, we shall say, is twenty feet square and twelve or fourteen feet high. In one of the sides a doorway is built for the purpose of gaining access to the interior. Against the inner walls are built various sized cabins with flat roofs. These cabins have no windows, but depend altogether for light and ventilation on a doorway. When these cabins are ranged against the walls the original building area of, say fifty square yards, is reduced to some ten or twelve. This remains roofless, and is the courtyard. These enclosures are closely packed together in double rows, and the lane running between them is, in many I have examined, not more than six or seven feet wide; so that these villages resemble nothing so much as aggregations of small-farm buildings and farmyards, each enclosed within its separate wall.

In the small courtyard of one of these village houses all the operations of life are carried on, such as cooking, eating, washing, &c. In one corner may be seen an uncovered and exceedingly primitive privy. In another the opening of the tank for drinking water. Near the door of the living room there is

often scooped out a hole or cellar into which is thrown all the refuse resulting from cooking operations. One of the cabin-like structures is used as a manure-room, wherein is stored as much filth and rubbish as possible, to be sold at intervals to the neighbouring farmers to spread over the fields. In others are found rabbits, poultry, and possibly a goat or pig. In a pent-up enclosure of this kind, reeking with all sorts of smells and swarming with flies and vermin, there usually lives a man, his wife and family of several children. These miniature courtyards are often very picturesque, with flowering plants scattered about, or a bright green vine trailing its branches irregularly over a corner of the enclosure, or partly roofing it by being trained along rude trellis-work. These plants, as might be expected, grow luxuriantly in the rich atmosphere of the courtyards, where they are protected from every breath of air.

The other, or central set of villages, lying between Valetta and Notabile, of which Hamrun, Zebbug and Birkircara are examples, are much more civilised than the eastern set, and as there has been a great increase of population in this part of the island of late years, very many of the houses are of modern construction. They are also more open, often have gardens, and may be said generally to take an intermediate position as regards their sanitary condition among the cities and villages of Malta.

Having thus dwelt briefly on the form of dwelling and population of the cities and villages of Malta, let us return to an important point, namely, their water-supply.

Valetta and the three cities are supplied principally by water collected from springs in the upper limestone hills some eight miles to the south-west. In the paragraph on the geological formation of Malta it will be remembered that, lying under the upper limestone, there is a bed of marl. Headings are driven for great distances at the junction of the limestone and marl, and the water, percolating through the very porous limestone, is caught on the marl, and finds its way in small streams along these headings, to be collected and conveyed to Valetta and the three cities by iron pipes under pressure. This water is principally conveyed in iron pipes, so that Floriana and Valetta have a constant supply under pressure of pure drinking water. This water can be obtained from numerous public taps,

and has also been introduced into many of the houses. Notably all the barracks have been supplied. It must be noted, however, that in many of the houses it is still stored in tanks under the houses.

This is a great improvement on what obtained in Valetta a few years back. At that time the water was conveyed in stone channels, by means of which the tanks under the houses were filled from time to time. These stone channels and underground tanks exposed the water to serious contamination.

The three cities are supplied by water conveyed from the south side of the island by the Fawara aqueduct, but until a recent date this water was stored in the underground tanks; in fact, it was only in June, 1887, that a constant supply under pressure was introduced.

The central set of villages lying between Valetta and Notabile, viz., Hamrun, Birkircara, Siggieui and Zebbug receive a plentiful supply of good water, but this is stored principally in underground tanks. Rabat and Notabile are provided with a good water supply, but a large quantity of the water consumed is from roofs and wells beneath houses. Other villages, such as Attard, Balzan, Lia and Musta receive in winter an abundant supply of aqueduct water; but this, again, is stored in underground tanks and largely used for agriculture.

The villages to the eastern end of the island, Zabbar, Zeitun, &c., have the worst water supply. The only source in 1887 was the water collected from the roofs, courtyards and lanes of the villages. In fact, in many of these enclosed dwellings which I have examined the rain is led by pipes from the roofs of the cabins to the courtyard, across which it streams and gains access to the well through an opening in the neck on a slightly lower level than the courtyard. From the description given above of the general filthy condition of these courtyards, swarming with children, dogs and poultry, some idea of the contaminated condition of the water in these tanks may be formed. As a rule it is so foul that the wonder is there is a single living being left in these villages. We have examined many samples of these tank-waters and found them all foul. In some instances the water, on being freshly drawn, was of the colour of pale sherry.

Let us now turn our attention to the removal of sewage in

Malta. As in treating of the water supply, we shall begin with Valetta, Floriana and the three cities. For the removal of sewage from these cities a complete and costly system of drainage by water carriage has been carried out for some years. Before that the drainage was effected by means of narrow channels cut in the porous sandstone, which conveyed, or failed to convey, the sewage into the harbours. The new main drain conveys the sewage by a circuitous route, several miles in length, and pours it into the sea at some distance from the mouth of the Grand Harbour. In the report of the last Cholera Commission by the sub-committee on the drainage, it appears that the street-sewers were found on inspection to be practically clean, that the gradients were sufficient to give a rapid flow, and the flushing apparatus worked efficiently; but the condition of the house-drains was less satisfactory. In almost every instance there was strong evidence of stagnation within the house-drains. The sub-committee satisfied themselves of this in several instances by pouring water down the drains and observing the putrid sewage that came out with the first flow. The sewage-flow seen in the street-sewers was black and putrid even close to the heads, giving further evidence of stagnation in the house-drains.

This defective action of the house-drainage is attributed to defective construction, principally as regards workmanship, and improper usage on the part of the occupiers. From this it would appear that although a great advance has been made in the drainage of the fortified cities, there still remains much to be done.

In the villages there are two methods of getting rid of the sewage. One is by pouring it into cesspools in the vicinity of the houses; the other, by throwing it into one of the rooms of the dwelling, which receives the name of manure-room. In the central set of villages the sewage is as a rule got rid of by the cesspool system. By law these houses should be drained into separate water-tight cesspools in the street, but this would entail the trouble of frequent emptying, so the builder, taking advantage of the numerous fissures in the porous sandstone, takes care that the cesspool will communicate with one of them. Mr. Osbert Chadwick, C.E., in a memorandum on drainage, states that these cesspools may be cemented to the satisfaction

of the sanitary inspector, but as soon as he is gone a few blows of the pick-axe suffice to make a leak. Many of these cesspools have never been emptied since they were made, the contents slowly leaking into the porous rock. As may well be imagined, this is a fruitful source of contamination to neighbouring wells; but the manure-room is the most transcendent abomination. This obtains, as was pointed out in a previous part of this paper, in most of the poorer villages, such as Zabbar, Zeitun, and those lying towards the eastern end of the island, where manure is valuable for use in the neighbouring fields. In this room, close to the living rooms and pent up by the enclosing walls, all the filth and refuse of the family and animals are stored. This hoard is increased by the daily addition of dung scraped up from the streets or roads by the younger members of the family.

From what has already been noted, it is evident that the sanitary condition of Malta, as regards drinking water and drainage, is mostly in a very barbarous condition, but as regards the most densely populated part of the island, viz., Valetta and the three cities, a very great deal has been done within the last few years. These cities, from being among the worst drained and worst watered of Mediterranean cities, are now amongst the best; but in regard to overcrowding in the fortified cities, the condition is becoming daily worse. In the report of the Cholera Commission it is stated "that the fortified cities, and even some parts of the villages of Malta, are overcrowded to an extent that is dangerous to public health. Many blocks of houses exist so closely packed together that it is impossible to secure the proper amount of light and air. The general arrangements of the existing villages, as we have seen, is highly insanitary. From the narrow and tortuous streets, lanes branch off which are even narrower and more irregular. These are the only means of access to the densely built-over quarters, and they often terminate in blind ends. There is therefore an inadequate supply of both light and air.

The Micrococcus melitensis.—It is by the entrance of this minute organism into the blood and organs of man that this disease is set up. It is therefore most necessary to study and understand it as fully as possible. This coccus or cocco-bacillus is about $0{\cdot}33\,\mu$ in diameter, and usually occurs singly or

in pairs, but when grown in broth it appears in short chains. "In broth cultivations after about ten days' incubation it is not uncommon to find chains of ten to fourteen members; these are very readily broken up, so that attempts to make permanent specimens are not invariably successful. A bacillary form also occurs in cultures which have been grown at ordinary temperatures (18° C. to 20° C.). Agar cultures, which have been started for a few days at body temperature, and then kept for a few weeks (*e.g.*, four) at room temperature, often consist almost entirely of bacilli; the same is true of the cultures grown on gelatine. The length of these bacilli is about two to four times the breadth; some of them are somewhat curved" (Durham).[6] It is non-motile. It stains easily with all the basic aniline dyes, but loses its colour very rapidly when treated with alcohol or other decolourising agent, and becomes unstained by Gram's method. The absence of a fixation agent makes the bacteriological examination of tissue sections at present an impossibility. It readily emulsifies. That is to say, the individual cocci are very loosely bound together, and readily separate on being stirred up in a drop of water, unlike, for example, the plague bacillus in this. This property makes it very satisfactory in agglutination experiments.

Artificial Cultivation.—The growth of this micrococcus is extremely slow. It is important that media which are only faintly alkaline should be used. If markedly alkaline no growth takes place. "It grows very scantily at a temperature of 18·5° C., growing best at about 37° C. or 38° C. At temperatures between 40° C. and 42° C. growth is suspended. Above 42° C. artificial growths die. If kept moist at 15·5° C. for long they die. Cultivations sent to England during the winter died on the way" (Hughes).

Growth in Broth.—After two or three days the broth becomes turbid. If allowed to stand for some time there is a deposit of flocculi, but the fluid remains turbid, and there is no pellicle formation. Indol reaction negative. No odour produced. "If serum from a case of Malta fever be added to the broth the fluid remains clear, and a compact, felt-like growth takes place at the bottom of the tube in the course of weeks" (Birt and Lamb).

Plate Cultivation.—"In well-diluted plate cultivations (*e.g.*,

ten or so colonies to the plate) the colonies attain a diameter of 1·0 to 1·5 m.m. in four days; 2·0 to 2·5 m.m. in ten days; after a few weeks they may attain a size of several millimetres, if the medium is kept moist. Though this discrepancy in the rate of growth may be due to an habituation to artificial media, it is more probably to be ascribed to the mode of preparation and condition of the agar, since cultures made from the tissues of infected rabbits and guinea-pigs are quite visible after three days' incubation, even though only one or two colonies develop. There is, however, here the possibility that the growth arises from a mass of several agglutinated cocci. The whiteness of the almost hemispherical colonies by reflected light, and the clean-bright brown translucency by transmitted light, are extremely characteristic; this appearance is retained to some extent in old colonies, several m.m. in diameter, but the bacterial mass then has a slightly brownish hue, and from its thickness becomes opaque. Such colonies are sometimes somewhat umbilicated. Under the microscope, seventy-two-hour-old plates show that the superficial colonies are circular, with an even border; they are bright and translucent, the periphery being pale grey, whilst the centres have a brownish tinge; the whole colony shows no definite structure beyond being very finely granular. With age they become less translucent, and brown up to the margin. The deep colonies (seventy-two hours) are very bright, with a slightly yellowish tinge; later they become a deep sepia brown. When large quantities are sown a confluent growth results. *Milk* is not clotted. *Neutral litmus whey* (Petruschky) becomes only slightly turbid; in twenty-four hours alkalinity is apparent; this increases slightly in the following days, but only reaches 3 per cent. of decinormal H_2SO_4 after three weeks' incubation, In 1 per cent. peptone solution, with either *lactose* or *glucose*, the coccus grows more freely; in both cases alkali is produced. No gas bubbles are formed. On *potato* it grown fairly freely. The growth is not visible, for there is no alteration of the surface; the condensation water becomes turbid. The cocci are rather larger than those grown on other media. On *coagulated blood serum* a white moist growth takes place. *Alkali-albumin jelly* (Lorrain Smith) is not a favourable medium for this coccus; this is in accordance with the observation that highly alkaline media are not well tolerated" (Durham).

Growth on Gelatine.—When stab cultivations are made into 10 per cent. nutrient gelatine, and kept at 22° C., little growth takes place. At the end of a month the needle track has become slightly developed, and on the surface can be seen a minute smooth white growth, not larger than a pin-head. No liquefaction of the gelatine takes place.

Growth on Agar-agar.—Cultures made directly from the organs after death on this medium show no growth for about four days if kept at 37° C., and seven days if kept at 25° C. After the organisms have been artificially cultivated for some time outside the body they acquire a tolerance of their new environment and grow more quickly, so that the growth may appear in as little as two days. The colonies when they do appear are small, transparent and dew-like, and may be only seen at the lower end of the slope. In a stab cultivation the growth appears as minute pearly white spots scattered round the point of puncture, and minute round white colonies are also seen along the course of the needle track. After some weeks the colonies on the surface grow larger and join to form a rosette-shaped growth, while the needle track becomes strongly marked, solid-looking, and yellowish-brown in colour, with serrated edges. After the lapse of some months the growth remains restricted in area and its colour deepens to buff. "If the medium is tinted with litmus a distinct alkaline reaction is seen by the third day" (Durham, Gordon).

This micrococcus can be distinguished from all other microbes by its slow growth, its appearance on agar, its microscopical characters, and its behaviour to specific serum.

"The micrococcus does not grow on sea-water solidified with agar, not even when the sea-water was taken from a sewage outfall and was of a distinct brown colour. The micrococcus grows on an agared solution of normal human fæces" (Zammit).[7]

Vitality of the Micrococcus.—"If kept at a suitable temperature colonies retain their vitality for three months" (Hughes). "The micrococcus of Bruce can be grown successfully from a culture seven months old" (Zammit). "Colonies on agar allowed to dry completely were found to be dead when tested three years later" (Hughes).

I am not aware that any experiments have been made in

regard to the vitality of this micro-organism in the dust, in soils, on food, or in water, but it certainly would be useful information, and it is to be hoped that all these points will soon be cleared up.

Habitat of the Micrococcus outside the Human Body.—No one has up to the present found this parasite in external Nature. We wrote in 1887 that on account of the high temperature required for its growth the length of time which elapses before the colonies appear, and the absence of any well-marked morphological or cultural characteristics, the search for it outside the body will be very difficult, if not impossible. Shaw made many experiments to try to isolate the microbe from the air of wards in the Naval Hospital, Malta, but with no success. Horrocks also examined the air of rooms in which cases had occurred, but always drew blank.

Kennedy writes from Malta "that there has been an extraordinary amount of Mediterranean fever amongst the men of the regiments this summer (1903), and we have put it down to the turning up of the soil in building new barracks and quarters near by." He goes on to say "that he feels more and more convinced that the disease is air-borne, and that a possible point of entrance is the tonsils." He does not, however, describe any experiments carried out to prove the truth of this theory, either in the way of examination of the soil or of the air.

In this quest after the micrococcus outside the body the first thing to do will be to find a suitable medium for its detection. We are glad to hear that Horrocks is persevering in this direction, and hope he will be successful. We do not know how the injection of suspicious material under the skin of monkeys would answer, but it might be tried. Suppose that the air of a particular room was to be examined. By a suitable apparatus any quantity of air could be drawn through water and that water injected. Again, this small body we see in the spleen and blood and which we call the *M. melitensis* may be under quite another form in some stage of its existence outside the body. This is not likely, but should be borne in mind.

How does the Micrococcus Leave the Body?—Kennedy writes that the examination of the breath of patients suffering from the disease has not yet given any result. No experiments have

been made in regard to perspiration. "Up to the present I have been unable to find the micrococcus in any of the samples of urine I have tried" (Kennedy).

"Various attempts have been made by us to isolate the organism from urine during the course of the fever in man. These have in all cases been unsuccessful" (Birt and Lamb). Horrocks also investigated the urine with the same result. Durham, on the other hand, states that as the result of his experiments on rabbits and guinea-pigs, the cocci were found in the blood, brain, spleen, liver, kidney, urine and femoral marrow, and he points out that in these animals, which died or were killed long periods after the inoculation, the presence of the cocci in the urine is especially to be noticed. He believes there is a localisation of the micrococcus in the kidney in cases which run a chronic course, and he gives a case of a guinea-pig which was killed seven months after inoculation, from whose urine a pure culture was obtained, whereas the organs were mostly sterile. This agrees with an observation made by me in 1887, in the case of Pte. G. W., who died of Malta fever fifty-three days after his admission to hospital. The micrococcus was only recovered from the kidney; the liver and spleen were sterile.

It is therefore evident that although the micrococcus has never been isolated from the urine of cases of Malta fever in man, still the probability is that the cocci do leave the body in the urine, and no efforts should be spared to settle this point by experiment. From the above it would appear that the older chronic cases would give more chance of success than the earlier and more acute. Few observations have been made as to the micrococci leaving the body by way of the bowel. Horrocks writes he has investigated the fæces of cases, but so far has failed to isolate the micrococcus. Lastly, there remains one other way of the coccus leaving the body, and that is by blood-sucking insects. It has been shown by Gilmour[8] and Shaw[9] that the coccus does exist in the blood; in fourteen cases examined by them the micrococcus was obtained in pure culture from the blood of seven. This theory of the micrococcus leaving the body through the instrumentality of biting flies is a favourite one at the present day. Zammit thinks a mosquito may do it, and Theobald goes as far as to point to the species

Acartomyia Zammitri (Theo.) as the carrier. If this is so, surely it would be easy enough to experiment on these lines, by keeping the mosquitoes in cages and feeding them alternately on affected and healthy monkeys.

How does the Micrococcus Enter the Body?—On this most important subject little or nothing is known. In 1887 we wrote that since this fever is caused by a definite vegetable organism it is difficult to picture such a particle rising into the air from fluid or solid substances in which it may be supposed to find a suitable soil for growth. On this account we thought it probable that Malta fever might be chiefly carried by means of drinking water or other fluid or solid foods to which the contagium had gained access. Against this is the fact that the great improvement which took place in the water supply of Valetta and the three cities did not diminish the fever to any marked extent.

The micrococci have never been found in water or foodstuffs. Zammit says he has not been able to induce the disease in monkeys by feeding them on micrococci. Wright also attempted to give the disease to these animals by feeding them on a suspension of the micrococcus in milk and also failed. Experiment is therefore against the micrococci gaining access to the body by water or food.

It is quite different as regards the skin. The smallest quantity of a culture applied to a scratch or injected under the skin will give rise to the disease in man and monkeys. In fact, this disease is one of the most dangerous to work with in the laboratory. Wright accounts for this by the fact that the blood has little or no bactericidal power on this microbe, so that the smallest quantity introduced into the blood may hold its own, grow and multiply.

We do not know whether this micrococcus will pass through the healthy skin or mucous membranes, but one case is reported in which infection was supposed to follow an accidental inoculation on the conjunctiva. As is known, touching the nostril of a guinea-pig with blood containing plague bacilli will give rise to the disease; experiments should be made to test this on monkeys with the micrococcus.

Kennedy thinks that a possible point of entrance is the

tonsils, but he does not seem to have made any experiments to strengthen this.

As this paper is already too long, we will take an opportunity of continuing the subject in a future number of the Journal.

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Echoes from the Past.

Guthrie's well-known "Commentaries on the Surgery of the War in Portugal, Spain, France and the Netherlands," from 1808 to 1815, contains perhaps the most valuable accounts extant of the experience of an English Army Surgeon before the days of anæsthesia and asepsis. Guthrie had been trained in too hard a school to be unduly soft-hearted, but the picture drawn by him of the miseries of the sick soldier and the mismanagement of the medical service of our armies under Wellington is too detailed and dispassionate to suggest exaggeration or partisanship.

The Inspector-Generals of hospitals in Guthrie's time were not only overburdened with administrative detail, but were persistently handicapped by an insufficiency of stores and *personnel.* Hence arose a multitude of abuses and some queer situations. After the battle of Saca Parte, where the Fourth Division of Infantry to which Guthrie was attached was engaged, the then Inspector-General of the Medical Department of the Army was so understaffed that he was found by Guthrie sitting on a pannier by the roadside, and apparently keeping guard over some twenty or thirty other panniers arranged in a semicircle around him.

"I am here," explained the great man to the young surgeon, "taking care of the medical stores of the army, whilst the apothecary is watering the mules, lest the muleteers should run away with them." This gentleman's successor was more inefficient than himself, and it was not surprising that between them 22,000 men of that army, as historians say was the case—or any other possible number—should have been in hospital.

The wounded soldier was in those days exposed to two great avoidable dangers, hospital gangrene and the old military surgeon's passion for amputation. The cause of sepsis was not, of course, understood, and so it was spread unwittingly by the very people who were most anxious to stamp it out. Thus in 1797 a quantity of charpie, already used in the great hospitals in France, was taken to Holland, and caused every ulcer to which it was applied to be affected with *pourriture d'hopital.* The story is told by Guthrie on the authority of Brugmans, who further describes how "hospital gangrene prevailed in one of the low wards at Leyden in 1798, whilst the ward or garret

above it was free." The surgeon made an opening in the ceiling between the two, in order to ventilate the lower or affected ward and in thirty hours three patients who lay next the opening were attacked by the disease, which soon spread through the whole ward. This was fully confirmed by Guthrie's experience in Portugal and Spain, where he had more than once seen whole hospitals infected by a single case. He vividly describes the horrible appearance of wounds attacked by the disease. He seems to be very near Listerism when he says, "In my hands constitutional treatment and every kind of simple mild detergent applications always failed, unless accompanied by absolute separation, the utmost possible extent of ventilation, and the greatest possible attention to cleanliness, and not even then, without great loss of parts in many instances.

According to Guthrie, our wars against Napoleon mark an immense advance in military surgery. In 1808, at the beginning of the war in Portugal, military surgery was still dominated by the opinions of John Hunter and J. Bell, who, though men of genius, had not seen enough service to render their views upon gun-shot wounds satisfactory to a man of Guthrie's experience. "It has cost me," he says, "the labour of seven campaigns and thirty years of teaching to overcome their errors."

The first effort to improve military surgery was made by Guthrie during the Peninsular Campaign, when after the Battle of Albuhera in 1811, he sent home his paper dealing largely with wounds of arteries.* "The principles, the practice, and the facts intended to be inculcated in that paper were in direct opposition to those which had been deduced from the writings of the great John Hunter and his immediate successors." It was a case of the mouse against the mountain, and even after a lapse of forty years Guthrie still found himself confronted by a certain amount of opposition. Guthrie insisted in this paper upon "the essential difference which exists between a local and a constitutional mortification in young persons who have suffered from a sudden and severe injury." He strongly condemned the doctrine "that an amputation in sound parts should follow, in most instances, the formation of the line of separation between the dead and the living parts." Experience had taught him that this amputation almost always caused the

* "Observations and Cases of Gun-shot Wounds," 1811.

needless loss of the joint above the mortified point and that it often resulted in the death of the sufferer. Amputation was often resorted to because the patient could not tolerate the odour of his own putrefaction, and Guthrie welcomed the use, as a deodoriser, of a solution of chloride of zinc, invented by Sir William Burnet. He doubtless saved many a limb that other surgeons would have removed, but, on the other hand, he established the necessity for immediate amputation in circumstances which up to his time were held to preclude its possibility. Thus he removed the thigh at the hip-joint in 1815, without first tying the femoral artery, and showed his patient, a French soldier, to all disbelievers.

"This," he says, "was the great point of advance in English and European surgery, and one great result of the practice of that war."

Of ambulance arrangements during the Waterloo period we learn nothing from Guthrie except by hints, but these suffice to show that they were murderously primitive. He gives us a glimpse, in one place, of wounded men lying on a little straw upon the ground, and limits his aspirations to the hope that surgeons will in future be young and supple men, able to stoop for hours over their recumbent charges. A surgeon of fifty cannot stoop much: he should be made an inspector!

Enlightened and a reformer of many abuses, Guthrie, as his long list of cases shows, was a devotee of bleeding, and it is curious to note the beneficial effects which he, and many of the officers upon whom he operated, attributed to his copious employment of this old world panacea. Strong men recovered *despite* the fearful depletions of blood to which they were subjected. A certain habit of trusting to chance and of taking to himself credit really belonging to the fortuitous nature of particular circumstances is as much a characteristic of the reforming and scientific Guthrie as of older and less enlightened surgeons. It is amusing, for instance, to find him inclined to be proud of the cure of a German soldier who really owed his recovery to mere luck. The man was under Guthrie's charge for three weeks, at the end of which time he stole a piece of meat, ate it greedily *more Teutonico*, and had to be given a strong emetic, which helped to evacuate foreign bodies not hitherto detected by the great army surgeon under whose care the worthy German lay.

REPORT OF THE ROYAL COMMISSION ON THE WAR IN SOUTH AFRICA.

As the actual volumes of this important report are unlikely to be accessible to the majority of members of our Corps, while the evidence contained in their pages cannot fail to be of interest to our readers, we propose giving a *précis* of the evidence so far as it relates to medical organisation before and during the late campaign. For this summary, which is continued from p. 377, vol. ii., we are indebted to Lieut.-Col. Edwin Fairland. It deals mainly with evidence regarding medical equipment.

V.

Col. Gubbins, M.B., M.V.O., examined, said he was Assistant-Director of the A.M.S. from March, 1895, to December, 1899, and afterwards served in South Africa as P.M.O., first of the Sixth Division and later of the Pretoria District, &c. . . . With regard to the preparations for the war, provision was made, roughly speaking, for about 80,000 men, *i.e.*, two Army Corps and two Cavalry Brigades. The *personnel* was amply sufficient for that; in fact, he thought 100,000 men might have been equipped with the greatest ease. . . . The first five divisions were quite complete with regulars — in the sixth division we had a very small percentage of civilians.

(Q. 3917.) . . . We always had plenty of medical equipment and of ordnance equipment. The orders for that rested with the Director-General of Ordnance, and he bought what we wanted.

(Q. 3919.) When you were speaking of the *personnel* you only spoke of the Medical Officers? Yes . . . . the same thing applies to the subordinate *personnel*. With the Sixth Division three-fourths of our *personnel* were R.A.M.C. regulars; but in order to get those we had to bring them home from Egypt, Malta, Gibraltar, Bermuda and different places; then we had practically exhausted the supply, and had to put up with recruits and anybody we could get hold of. The St. John Ambulance Brigade men were a great help to us; but it took about three months to train them. When trained they were excellent. . . . A much larger number of stationary and general hospitals were sent to South Africa than under ordinary circumstances would be required. They are units on the lines of communication—it might be 100 miles, 600 miles, or 800 miles from the base.

(Q. 3927.) The regulations in force did not provide for the expansion that was required? We only had the equipment of one general hospital and two stationary hospitals stored at Southampton to provide for any sudden emergency, and as a kind of type plan of

what these units would require. . . . In 1894 Sir Redvers Buller found fault with the cumbrous nature of the material of the General Hospital, and he appointed a Committee, which simplified and brought up to date a good deal that was really a kind of standard for general hospitals when the war broke out.

But as regards finding the equipment there was no difficulty nor delay? . . . In my opinion it would be the greatest possible mistake to buy a lot of equipment in peace and store it up, it might be ten or twenty years, and then become obsolete. It is far better, with large commercial houses in London, Birmingham and all over the country, to buy in the market when the time comes. . . . As regards expansion of the system, there was nothing laid down in black and white, but it was tacitly understood we could always increase.

(Q. 3937.) . . . The mobilisation worked easily and satisfactorily. The chief difficulty was the constant change in the composition of the force going out. At one time it was decided to send only 10,000 men, then 20,000, then an Army Corps; but when once it was decided to mobilise an Army Corps and a Cavalry Division, it worked with the greatest smoothness, and there was no difficulty whatever. . . . . I was always told by Col. Lyttelton and Col. Stopford that two Army Corps and a Cavalry Division were the utmost that we would have to send abroad. . . . As far as our branch was concerned, we were quite ready in a week. One thing that helped us was the Fashoda scare the year before; owing to that we were able to decentralise our equipment and make arrangements to bring it up to date . . . and if we had only sufficient *personnel* we should have had no difficulty with double or treble the number.

(Q. 3943.) But you agree with the opinion that the R.A.M.C. was wholly insufficient at the start in equipment for the war? I will not say equipment. because that could be got; but it was wholly insufficient as regards *personnel*. Then another point is about field hospitals. The number of beds, or so-called beds, were reckoned amongst the percentage of beds laid down for the campaign. The war has taught us that is wrong; we cannot call them "beds" in the true sense of the word, because there is not such a thing as a bed; the man is simply put on the ground, and nothing ought to be reckoned as a bed except those in a general or stationary hospital. We are all agreed that the field hospital ought to be an exceedingly mobile unit, which can follow the Army at, say, twenty-five miles a day, unencumbered with bedsteads or any heavy equipment. . . . At Paardeberg we had 300 wounded in a place meant for 100. We put them under trees and did all we could for them; but that field hospital had to march right away to Bloemfontein in a few days, which it could not have done encumbered with heavy equipment.

(Q. 3946.) Sir William Wilson suggested that light beds might be used in the third field hospitals with advantage? I do not agree with that—the tents might be improved. Bell tents are unsuitable for sickness; tortoise tents to hold sixteen or eighteen men would be better. The equipment of a field hospital might be much improved. The want of pyjama suits was great. After Paardeberg we had to cut the clothes off the wounded men, it being saturated in blood, and we had nothing to put the men into; we had to roll them up in blankets. . . . We had not only ample medical supplies for our own people, but we had to supply the refugee camps as well. All their medicines came from us, and there were nearly 100,000 people at one time there. The things we most failed in were bedpans and urinals. . . . . If I were recasting the tables (of equipment) I would put in three times the number.

(Q. 3950.) . . . The numbers were based on the experience of campaigns in India, Egypt and other places.

(Q. 3957.) . . . We did not sufficiently provide for those tremendous outbreaks of enteric and dysentery. The food was always excellent —that supplied by the Army Service Corps. The milk was always a difficulty; the authorities did the best they possibly could. They collected all the milk into a central depot, and distributed it from there; and later on we had a sterilising depot also. There is another unit which this war has brought to notice which I have never seen mentioned, and that is the convalescent camp—the half-way house between the General Hospital and the fighting line. We had a large one at Pretoria capable of holding 600 men, and it was of the greatest assistance to men discharged from the 2,700 beds of the four General Hospitals who were not fit to return to the ranks or go out on trek. They also supplied hospital orderlies to a great extent, clerks, servants, and men of that sort, and in that way they relieved the fighting units.

(Q. 3952.) There was some criticism upon the employment of convalescents in that way, was there not? I know it is wrong, but still it was a necessity; you could not get on without them. At Pretoria half the orderlies were convalescent soldiers.

(Q. 3953.) Did you find much objection yourself from that course being adopted? No. They are not as good as our men, they have not the training; but they have the discipline, and I would far rather have them than novices—people you pick up anywhere. But in loyalty to the General, I had to go round and parade these men, and turn them off when I saw them fit to go back to the ranks—that was an understanding with them.

(*To be continued.*)

Correspondence.

DUM-DUM FEVER? KALA AZAR? NON-MALARIAL REMITTENT FEVER?

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—In an editorial article in your February issue, you allude to the fever associated with the presence of Leishman-Donovan bodies in the liver and spleen under the heading of "Dum-dum" fever, and two cases are reported by Mathias and Blackwell in the March issue under the same designation. The fever associated with these bodies is not, however, confined to Dum-dum or its neighbourhood. Donovan reports that he was able to verify their presence in forty-six cases in Madras in the course of three or four months; cases have been published by Manson and Low in patients from the Terai, and one by Marchand and Ledingham from Peking. Bentley telegraphs that he has found them in Assam in cases of kala-azar, and bodies apparently identical have been found by T. H. Wright in a case of oriental sore from Asia Minor.

It is obvious, therefore, that the infection is widely distributed and of diversified relationships, and the use of the topographical name of "Dum-dum" fever is much to be deprecated.

Leishman, followed by Manson and Low, sees in these cases considerable resemblance to kala-azar, but we must await confirmation of Bentley's observations before admitting their identity. I have, however, for many years pleaded for the recognition of "non-malarial remittent fever," on clinical grounds, in the nomenclature of tropical diseases; and the details of the published cases seem to indicate that the fever which is associated with Leishman's bodies could be most appropriately included under that non-committal and non-topographical name. Laveran and Mesnil are apparently prepared to accept such a designation, for they recommend "a systematic search for Leishman's bodies in the non-malarial fevers of Southern Asia, and especially of French Indo-China."

If, as is extremely probable, these bodies are found to be the cause of fevers of irregular remittent character, in widely separated parts of the world, it would be pitiable to have them stereotyped as "Dum-dum fever."

A. CROMBIE, M.D.

Reviews.

METHODS AND CALCULATIONS IN HYGIENE AND VITAL STATISTICS. By H. W. G. Macleod, M.D. Cr. 8vo, pp. 150, with 28 figures in text. Price 5s. net. C. Griffin and Co., Exeter Street, London, W.C.

THE author of this small book was once in the Indian Medical Service, and has consequently a sympathetic appreciation of the difficulties experienced by young officers when confronted with the various mathematical difficulties associated with the early study of some subjects in State medicine. Were the general scholastic training of young medical men better, and their scientific education more thorough than circumstances indicate them to be, we do not think the need of such a book as this would have suggested itself; but in the light of our own experiences as a practical teacher, we are disposed to think that Dr. Macleod's book will be found useful to a large number of workers. The volume will not replace, but merely supplement, the ordinary text-books; if used in this manner we cordially commend it.

R. H. FIRTH.

FIRST DRESSING ON THE BATTLEFIELD.

A most interesting paper on the above subject is contributed to the December issue of the *Journal of the Association of Military Surgeons*, by Col. Nicholas Senn, M.D., Surg.-Gen., of Illinois.

The paper was originally presented to the military section of the Madrid International Medical Congress, and is largely based on personal experience gained in the Greco-Turkish and Spanish-American Wars. The terrible consequences of infected gun-shot wounds noticed in the American Civil and the Franco-Prussian Wars are contrasted with the wonderful surgical results obtained in more recent campaigns, and the following three factors are held to be largely responsible for the change: (1) Modifications in the weapons and projectiles; (2) the abandonment of the probe in searching for bullets; (3) the use of the First-Aid dressing applied as soon as possible on the receipt of the injury. The last of these contributory causes is very fully discussed.

The value of First-field dressings is emphatically stated, having been well demonstrated in the Spanish-American and South African Wars. In the words of the author: "The surgical records of the Spanish-American War will bear testimony to the life and limb-saving utility of the first-field dressing behind the fighting line. The same can be said of the South African War, where the field dressing was almost always applied in the battlefield, and seldom removed at the first dressing station. At Magersfontein 500 wounded were dressed on the field and transported to the rear during the heat of battle, exposed at the distance of a mile to the fire of the enemy, with results which will always be a credit to the Medical Service of the British Army."

Numerous varieties of these dressings suggested, or at times used,

are described in detail and criticised, and the writer formulates the following requirments: (1) The dressing must be simple in its construction in order that it may be applied efficiently by unskilled hands, and with the least possible delay; (2) the dressing material employed must not interfere with the free evaporation of the wound secretion; (3) the dressing material must be hygroscopic, and not only aseptic but antiseptic; (4) the antiseptic used must be non-volatile and resistant to chemical changes for a long time; (5) it must contain a fixation material which will prevent displacement of the dressing after it has been applied; (6) all dressing materials must be kept ready for use in a waterproof cover.

The varying opinions as to who shall apply the first-field dressing are passed in review, and figures are quoted as to the wounded in battle which "cannot fail to convince those who are placed in charge of the wounded of the utter impossibility of rendering timely aid if this function should be limited to medical officers only." The dressing must therefore be of such a nature as to be readily applied by the wounded themselves, their comrades, or the bearers of the Sanitary Corps.

The employment of an impermeable covering to the dressing *in situ* is banned in the following terms: "All attempts to exclude the atmospheric air from the dressing in contact with the wound prevent evaporation of the wound secretions, maintain heat and moisture in the dressing, and by doing so create a condition most favourable to the growth of pathogenic microbes, which are never absent in the immediate vicinity of the wound on the surface of the skin." This is in accord with South African experience. Stress is laid on the necessity of the dressing being not only aseptic but antiseptic, in view of the fact that the surface of the skin beneath the dressing is always inhabited by pathogenic germs, and that any preliminary disinfection of the skin is impossible. The choice of an efficient durable antiseptic is dealt with. The claims of carbolic acid, mercuric bichloride, iodoform and other drugs are discussed, and the writer pronounces in favour of a mixture of salicylic and boric acids, mixed in the proportion of four to one and finely powdered. A bandage by itself is insufficient to fix the dressing, and some strips of rubber adhesive plaster are considered a necessary adjunct.

The following is a description of the dressing devised and advocated by Col. Senn: (1) Two compresses of sterile absorbent compressed cotton, 4 inches by 4 inches; in the centre of each of these is incorporated half a drachm of borosalicylic powder, the spot being marked on the gauze cover of the compress by a drop of tincture of iodine; (2) a sterile gauze bandage, 4 inches wide and 2 yards long; (3) two strips of rubber plaster, 1 inch broad by 8 inches long, one attached to the outer side of each of the compresses; (4) two safety pins attached to the free end of the bandage; (5) an inside cover of fine paraffin paper; (6) an outside cover of waterproof linen, on one side of which directions are printed. The first cotton compress is rolled once or twice in the beginning of the bandage, and unfolding prevented by two light aseptic threads; the second compress is loosely attached by two light stitches to the first, they are then placed face to face,

plaster outside, and rolled up in the remainder of the bandage. If a single wound is to be dressed both compresses are applied over it, with the adhesive strips in opposite directions, the bandage rolled over them and fixed with the pins. If two wounds require dressing the compresses are separated by tearing the threads fixed by the plaster, and the bandage is used whole, or divided according to use.

The paper, which is a most instructive and comprehensive one, further discusses the arrest of primary hæmorrhage, the fixation of injured parts, the transportation of the wounded, the protection of non-combatants and wounded on the battlefield, the instruments required on field service, and the ultimate prophylactic value of First-Aid dressing, on all of which points much valuable light is thrown; and is summarised in twenty-four conclusions, which take rank as military medical aphorisms. The article deserves careful perusal and study by all military surgeons, and is commended to all officers of the Corps.

M. W. Russell.

Corps News.

Royal Army Medical Corps.

Capt. P. S. Lelean, from Seconded List, to be Capt., dated December 14, 1903.

Major Henry P. Birch, half-pay, Royal Army Medical Corps, retires on retired pay, dated February 17, 1904. He entered the Service in 1884, and was promoted Surg.-Major in 1896. He was placed on temporary half-pay on account of ill-health, September 14, 1903. His war services are as follows: Soudan Expedition, 1884-5—Nile, medal with clasp; bronze star; South African War, 1901-2—King's medal with two clasps.

The date of the promotion of Lieut.-Col. J. F. Williamson, M.B., C.M.G., is November 20, 1903, and not as stated in the *London Gazette* of December 22, 1903.

The date of the reversion from the Seconded List of Capt. T. H. M. Clarke, C.M.G., D.S.O., is November 23, 1903, and not as stated in the *London Gazette* of December 15, 1903.

The undermentioned Lieuts. to be Capts., dated January 29, 1904:—

A. J. W. Wells, G. F. Sheehan, H. H. Scott, M.B., H. A. Bransbury, M. W. Falkner, R. N. Woodley, E. Ryan, E. E. Parkes, M.B., J. V. Roche, A. J. Hull, R. V. Cowey, J. Conway, J. H. Barbour, M.B., F. E. Robinson, M.B., S. Mason, J. S. Bostock, M.B., A. H. McN. Mitchell.

Lieut. A. C. H. Gray, M.B., is seconded for Service under the Foreign Office, dated February 4, 1904.

Capt. and Brevet-Major A. F. Tyrrell is placed on half-pay on account of ill-health, dated February 11, 1904.

The undermentioned Lieuts. are confirmed in that rank:—

W. F. Ellis, F. W. W. Dawson, M.B., J. H. Duguid, M.B., G. W. G. Hughes, A. C. H. Gray, M.B., D. P. Watson, M.B., T. S. Dudding, J. E. Powell, F. W. M. Ommanney, O. Ievers, M.B., R. H. McNicol, M.B., H. H. J. Fawcett, S. L. Pallant, N. D'E. Harvey, M.B., C. R. Bradley, S. E. Lewis, M.B., G. A. Kempthorne, J. T. McEntire, M.B., F. M. G. Tulloch, P. J. Hanafin, J. D. Richmond, M.B., E. M. Glanvill, M.B., M. C. Wetherell, M.B., H. C. Hildreth, G. S. Mackay, M.B., W. MacD. MacDowall, R. T. Collins.

The undermentioned Majors to be Lieut.-Cols., dated February 2, 1904:—

R. J. Geddes, M.B., D.S.O., D. V. O'Connell, M.D., A. Dodd, G. Wilson, M.B., J. M. Reid, M.D., T. B. Winter, F. S. Heuston, C.M.G., G. F Gubbin, M. O'D. Braddell, M.B., J. J. C. Donnet, H. M. Sloggett.

Major J. Will, M.B., is seconded for Service under the Foreign Office, dated February 20, 1904.

Capt. F. S. Walker, F.R.C.S.I., is placed on temporary half-pay on account of ill-health, dated February 19, 1904.

Major R. E. Kelly, M.D., from half-pay, retires on retired pay. dated March 12, 1904. He entered the service in 1886, and was promoted Major in 1899. He was placed on temporary half-pay on account of ill-health, February 6, 1902. He served in the South African War, 1899-1900.

Memoranda.

P.M.O. 4th Army Corps reports that Lieut. R. L. V. Foster, R.A.M.C., has obtained the degrees of M.B., B.S., and M.A.Cantab.

The Sir William Taylor Prize of 25 guineas has been awarded to Major M. P. C. Holt, D.S.O., R.A.M.C., in recognition of distinguished professional attainments in surgery as evidenced by the returns of operations performed in Ireland, a summary of which appeared in the Corps Journal of last month.

This Prize is awarded annually by Sir W. Taylor to the executive officer of the Royal Army Medical Corps on the active list, or on full pay employment below the substantive rank of Colonel, who shall, in the opinion of the Committee, be most deserving on account of professional or scientific work.

The regulations governing the award were published in the Journal for October, 1903.

Army Medical Reserve of Officers.

Surg.-Lieut. V. Graham, 2nd Volunteer Battalion York and Lancaster Regiment, to be Surg.-Lieut., dated February 20, 1904.

Surg.-Lieut. N. P. Watt, to be Surg.-Capt., dated February 13, 1904.

The notification which appeared in the *London Gazette* of the February 2, 1904, stating that Surg.-Capt. W. P. Peake ceased to belong to the Army Medical Reserve of Officers, is cancelled.

Surg.-Lieut. A. A. MacKeith, M.B., 1st Hampshire Royal Garrison Artillery (Volunteers), to be Surg.-Lieut., dated February 27, 1904.

Royal Army Medical Corps (Militia).

Lieut. M. A. Cholmeley resigns his Commission, dated March 12, 1904.

Royal Army Medical Corps (Volunteers).

The Glasgow Companies.—Capt. D. Christie, M.B., from Argyll and Sutherland Brigade Bearer Company, to be Capt., dated March 5, 1904.

The London Companies.—Lieut.-Col. and Hon. Col. J. E. Squire, M.D., resigns his Commission, with permission to retain his rank and to wear the prescribed uniform, dated March 5, 1904.

The Manchester Companies.—The undermentioned gentlemen to be Lieuts.:—

Wilfred Edwin Rothwell, M.B., dated March 5, 1904; Alfred Francis Thompson, M.B., dated March 5, 1904.

The Maidstone Companies.—Surg.-Lieut.-Col. J. Cantlie, M.B., 7th Middlesex Volunteer Rifle Corps, to be Hon. Lieut.-Col. Commandant, dated March 5, 1904.

Volunteer Corps.

1st Dorsetshire Royal Garrison Artillery.—The undermentioned gentlemen to be Surg.-Lieuts.:—

Thomas Alfred Walker, dated February 20, 1904; Telford Telfordsmith, dated February 20, 1904.

7th Lancashire Royal Garrison Artillery.—Joseph Grant-Johnston, Gent., to be Surg.-Lieut., dated February 20, 1904.

8th (Scottish) Volunteer Battalion the King's (Liverpool Regiment).—The initials of Surg.-Capt. Macalister, M.D., whose promotion was announced in the *London Gazette* of February 12, 1904, are C. J. and not J. C. as therein stated.

6th (Fifeshire) Volunteer Battalion the Black Watch (Royal Highlanders).—David Elliot Dickson, M.B., to be Surg.-Lieut., dated February 20, 1904.

1st Volunteer Battalion the Buffs (East Kent Regiment).—Surg.-Capt. A. E. Larking, M.D., resigns his Commission, dated February 27, 1904.

4th (Hunts) Volunteer Battalion the Bedfordshire Regiment.—The undermentioned Surg.-Lieuts. to be Surg.-Capts.:—

E. J. Cross, dated February 27, 1904; W. F. Fisher, M.B., dated February 27, 1904.

1st Volunteer Battalion the Lancashire Fusiliers.—The undermentioned Surg.-Capts. to be borne as Supernumeraries whilst doing duty with the Lancashire Fusiliers Volunteer Infantry Brigade Bearer Company:—

R. Mitchell, M.D., dated February 27, 1904; A. P. Nuttall, M.D., dated February 27, 1904; J. W. Cook, M.B., dated February 27, 1904.

1st Sussex Royal Garrison Artillery.—Harold Harris Elborough Scatliff, Gent., to be Surg.-Lieut., dated January 23, 1904.

4th Volunteer Battalion the Queen's (Royal West Surrey Regiment).—Supernumerary Surg.-Capt. E. J. G. Berkley resigns his Commission, dated March 5, 1904.

1st Roxburgh and Selkirk (The Border).—George McKellar, M.D., to be Surg.-Lieut., dated March 5, 1904.

3rd Volunteer Battalion the Welsh Regiment.—Brigade-Surg.-Lieut.-Col. E. Jones, Senior Medical Officer, Welsh Volunteer Infantry Brigade, resigns his

Commission and is granted the Honorary rank of Surg.-Col., with permission to wear the prescribed uniform, dated January 22, 1904.

1st Volunteer Battalion the Prince of Wales's (North Staffordshire Regiment).—Edgar Harold Brunt, Gent., to be Surg.-Lieut., dated March 5, 1904.

The Queen's Rifle Volunteer Brigade the Royal Scots (Lothian Regiment).—Surg.-Lieut. J. Scott, M.D., to be Surg.-Capt., dated March 12, 1904.

1st (Pembrokeshire) Volunteer Battalion the Welsh Regiment.—William Reginald Eyton Williams, Gent., to be Surg.-Lieut., dated March 12, 1904.

Imperial Yeomanry.

Nottinghamshire (Southern Nottinghamshire Hussars).—Surg.-Capt. H. Williams resigns his Commission, dated March 5, 1904.

Volunteer Infantry Brigade Bearer Company.

Sussex and Kent.—The appointment of Capt. C. J. Jacomb-Hood to command, which was announced in the *London Gazette* of February 2, 1904, is cancelled and the following substituted: Capt. C. J. Jacomb-Hood is appointed to command, under Paragraph 55a, Volunteer Regulations, *vice* Major J. Turton, appointed Senior Medical Officer, Sussex and Kent Volunteer Infantry Brigade, dated February 3, 1904.

ARRIVALS HOME.—Lieut.-Cols. W. T. Johnston, R. R. H. Moore, H. L. E. White; Majors A. W. Bewley, D. D. Shanahan, A. O. C. Watson, W. E. Hardy, V. H. W. Davoren, W. A. S. J. Graham; Capts. E. W. Powell, F. G. Fitzgerald, A. W. N. Bowen, A. H. Young, J. McD. McCarthy.

EMBARKATIONS.—India: Capts. W. J. Taylor, A. E. Milner, K. M. Cameron, and F. R. Buswell; Lieuts. J. M. M. Crawford and J. B. Meldon. West Africa: Lieut. C. W. Holden.

POSTINGS.—Thames District: Majors W. A. S. J. Graham and O. R. A. Julian, C.M.G. Scottish District: Major A. O. C. Watson. Ireland: Lieut.-Col. W. T. Johnston, Major A. W. Bewley, Capt. F. G. Fitzgerald. North-Western District: Capts. A. W. N. Bowen, A. H. Young and J. McD. McCarthy. Southern District: Lieut.-Col. C. Seymour. Aldershot: Lieut.-Col. R. R. H. Moore. Woolwich: Lieut.-Col. H. L. E. White. Western District: Major V. H. W. Davoren.

Capt. C. F. Wanhill has been appointed Sanitary Officer of the Bermuda, Canada and West Indian Commands.

Major M. P. Holt, D.S.O., has been appointed Specialist in Operative Surgery at Dublin.

Lieut.-Col. W. Babtie, V.C., C.M.G., and Brevet-Col. D. Bruce, F.R.S., have been selected for increased pay under Article 362 Pay Warrant.

DUBLIN DISTRICT STAFF.—*Arrivals:* February 2, 1904, Capt. D. J. Collins, R.A.M.C., from Medical Staff College, London; February 3, 1904, Capt. C. G. Spencer, from Medical Staff College, London; February 18, 1904, Capt. H. W. O'Reilly, from Limerick.

Leave: Lieut. M. G. Winder, March 1, 1904, to March 31, 1904.

CASUALTIES, &c., from February 11 to March 10, inclusive.

Discharges.—"Purchase": Pte. A. W. Ellis; "1st Period": A. W. King; "Free after thirteen years": Corpl. E. J. Nettleton; "1st Period": Pte. M. F. Sheridan; "Purchase," Lce.-Corpl. H. Barron; "Medically unfit": Pte. W. Hurst.

To Army Reserve.—Ptes. W. Downham, J. Shilliday, W. R. Gray, H. Smith, T. Neal, H. Whitling, R. Davison, W. Nelson, R. M. Campbell, T. Downs, D. Armour, R. Brodley, J. Chandler, A. W. Roach, A. Hunter, P. Moone, A. Stokes, T. Partridge, W. Lavery, H. Graham, A. J. Griffin, L. Simmons, R. McKee, W. C. Stanley, J. Rainey, J. S. Proctor, E. R. White, H. Gunning, T. G. Wort, E. Cunningham, G. H. Harris, E. H. Beard, J. Morrison, J. W. Hughes, G. S. Pulland, F. Stratton, H. Ormond, L. James, R. W. Pugh, W. Havern, J. Lavery.

Transfers, &c.—Bugl. H. Sturgess to Ranks; Pte. H. Murray to R.I

Rifles; Pte. H. Brown to A.S. Corps; 1st Cl. Staff-Sergt. H. Lattimore to Glasgow Companies R.A.M.C. (Vols.).

Embarkations.—Per ss. "Dunera," February 20: For Gibraltar: Corpls. R. G. Tovell, R. B. Eallett; Ptes. W. J. Robertson, W. Morey. For Egypt: Ptes. R. F. Rowland, L. Sufrin, W. D. Woodrow, A. Barber, D. Murphy. For Malta: Ptes. E. Binniugton, R. Cowx, T. G. Walshe.

Disembarkations. — From China, Ceylon, Egypt, &c., per ss. "Dilwara," March 3: Sergt.-Major T. D. Conway; 2nd Cl. Staff-Sergt. A. P. Paddick; Sergts. J. Sallis, R. Spencer; Corpls. E. Malcolm, A. Tollafield, W. C. Skinner, J. F. Turner, W. Hague; Ptes. A. Morgan, A. Judd, E. J. Grenney, S. Edwards, J. Cohen, R. Brown, R. Hallthorpe, W. Nieser, T. Bye, F. H. Cook, G. Fogg, J. Tillett, L. P. Unwin, T. C. Wallace, G. Wicks, J. Brown, A. E. Milborne, J. M. Wheeler, C. Wheeler, F. Ellis, T. J. Woolley, G. Davenport, J. T. Fowler, A. E. Pitcher, R. Watling. From Canada, per ss. "Parisian": Pte. W. J. Bates. From Mauritius, per ss. "Greek": Pte. J. Smith. From South Africa, per ss. "Guelph" and "Dunera": Corpl. W. C. Banks; Ptes. A. W. King, C. Proctor; 2nd Cl. Staff-Sergt. H. A. James; Sergt. J. Goggin; Corpls. J. Lunney, T. Ray, E. R. Watts; Ptes. J. French, J. S. Gardiner, E. J. Gibson, W. Skinner, W. Robertson, T. Watts; Sergt. R. E. Manwaring; Ptes. T. Buckell, A. Jones, J. Smith, and forty Privates shown as "To Army Reserve."

Death.—Pte. F. C. Brown, at Cairo, February 19; multiple injuries, accident.

LONDON COMPANIES, R.A.M.C. (Vols.).—Major Gibbard writes: "The Countess Howe has kindly presented to these Companies a Silver Cup to be competed for annually, the subject being 'The Care of the Sick, and the Management of Wards in Military Hospitals.'

"It is Lady Howe's desire that the competition should be as practical as possible, the care of the sick and wounded, especially the details of nursing, including ward cookery, to receive more attention than Army Forms, &c.

"*Funeral of H.R.H. The Duke of Cambridge.*—The Ambulance arrangements for part of the route, from Hyde Park to Kensal Green, were entrusted to these Companies, which furnished the necessary officers, stretchers, squads and ambulance stations, including five ambulance waggons horsed by the Companies and driven by men of the Transport Section."

NOTES FROM BELLARY.—Capt. Morphew writes: "Lieut.-Col. H. K. Allport, after being just a year in the Station, has left for England, tour expired, and the command of the Station Hospital has been taken over by Major J. F. M. Shine, from Calicut. Capt. E. Blake Knox, who served here for a few months, has left for duty with the P.M.O. H.M.'s Forces in India, and is now at Simla.

"Plague is causing a good deal of anxiety. At first it was confined to the bazaar, but lately several cases have occurred among the servants living in the go-downs in officers' compounds: it is quite impossible to make them understand the danger of visiting their relations in camp or infected areas. We are constantly finding dead rats and squirrels in stables and outhouses, consequently the disinfecting staff is kept very busy. The chief method adopted by the civil authorities, under whose control all the bazaars are, they being outside cantonment limit, is to vacate all houses in streets near which plague cases have occurred: nearly the whole bazaar is evacuated, and the houses are to be kept empty till the hot weather is well established. It is hoped that disinfection will be thoroughly carried out, despite the difficulties which we know to be so great, or else the disease will reappear as soon as the climatic conditions are favourable. So far no cases have occurred among the British Troops, but the Native Cavalry have had several cases, and are all under canvas: one of their British officers is now under treatment. Fortunately the Field Battery, with its innumerable followers, is away, and by the time it returns, which may not be till the end of March, it is hoped that the disease will have disappeared.

NOTES FROM BLOEMFONTEIN.—Capt. Goddard writes: "A Cricket Club has been formed, but owing to many changes in the detachment not many matches have been played.

"Col. Goggin, Capts. G. Ormsby, L. Humphry, and J. W. West form the Polo team, and under the coaching of our C.O. (Col. Goggin) are rapidly improving their game.

"Since September, the following changes have taken place: Lieut.-Col. C. Birt, on return from leave, has been transferred to Pretoria; Capt. Gill has gone home on six months' leave; Capt. Vaughan Williams and Civil Surg. H. Jacob to Ladybrand for duty, and Civil Surg. H. Cory, from Ladybrand here.

"Enteric fever, so prevalent here during the war, is again in evidence, markedly so amongst the civil population. The type of the disease is a severe one.

"Taking advantage of our well-arranged operating hut, several operations for the radical cure of hernia, and for appendicular disease, &c., have lately been successfully performed.

"The patients from the Army Tubercle Sanatorium, which was temporarily situated at Thaba-Nchu, have now been brought in here. Those sufficiently recovered and who desire it are being discharged in this country, and most of these have already obtained suitable work. On account of its dust, it is doubtful if Bloemfontein can be considered so suitable a place as the open veldt for the treatment of this disease."

NOTES FROM ISMAILIA.—Major Ronald Ross writes: "Bryce has just returned from Ismailia. Results absolute. The whole party were put to sleep by Prince d'Arenburg (President) without mosquito nets (I do not mean he sang them to sleep!). Malaria reduced by about 80 per cent. But the money spent was about £4,000 capital and £900 per annum (roughly). Compare Mian Mir, where they spent £500 altogether."

NEWS FROM HONG KONG.—Lieutenant Craig writes: "The transport 'Dilwara' arrived last month, having on board for this Station Lieut.-Col. Coates, Major Sparkes, and Capt. Johnson, R.A.M.C., with eight N.C.O.'s and men of the Corps. Major Bewley and nine N.C.O.'s and men of the Corps left for England on the departure of the 'Dilwara.'"

NOTES FROM PEKING.—Capt. F. E. Gunter, R.A.M.C., has devised a system of Dhoolie drill at his hospital in the British Legation at Peking. Major Powell, S.M.O., North China, has adopted it in the British Field Hospital, Tientsin. The adaptation of the stretcher drill to Dhoolies appears to have been ingeniously carried out, and is easily comprehensible by the Bearers.

NOTES FROM POONA.—Lieut. Potter writes: "There has been an almost complete change in the *personnel* of the Corps at this Station during the past month, Lieut.-Col. Dodd having gone to Mhow, while Major Forrest has taken over command of the Station Hospital as a temporary measure, *vice* Lieut.-Col. Harwood, officiating P.M.O. Poona District.

"Lieut. Rutherford, who joined the Station in December, has gone to South Africa in medical charge of the last batch of Boer prisoners, the irreconcilables from Ahmednagar, who have at length taken the oath."

NOTES FROM THE PUNJAB.—Capt. Birrell writes: "The retention of Major B. F. Zimmermann, R.A.M.C., in command of the Station Hospital, Campbellpore, for another year, has been sanctioned.

"Major J. J. Russell has been transferred from Mian Mir to Rawal Pindi.

"Major B. H. Scott has been transferred from Umballa to Rawal Pindi; there he is employed under Major J. C. Weir, Sanitary Officer, Punjaub Command, preparatory to taking over charge of that appointment.

"The following officers sailed for England, tour expired, on January 8, 1904: Major B. A. Maturin, Major C. A. Young, Capt. W. E. Hudleston.

"Major A. L. Borradaile has been transferred to Home Establishment, with effect from January 20, 1904, while on leave in England."

NOTES FROM SIERRA LEONE.—Major F. Smith writes: "I am in camp by myself at present, half a mile from any dwelling. I found ankylostomes in a man who had been three months in hospital for remittent fever. There is nothing very new in this, as I found the thing in 1899 and notified it to the *Lancet*, but the disease has not been looked upon as a Sierra Leone one.

As a result of this, Capt. A. C. Fox has brought me two other men suffering from the same disease, so that we are going to enquire into the extent of it as a cause of military inefficiency. In the meantime I have found the ova in fæces deposited in the bush in our water catchment area, and that explains the source of infection."

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE:—

Appointments: To be Matron, Miss G. M. Richards, posted to Woolwich temporarily.

Staff-Nurses: To join at Cambridge Hospital, Miss W. M. Jay, Miss F. M. Macgregor, Miss M. Macgregor.

The following promotions have been gazetted:—

Staff-Nurses to be Sisters, dated February 16, 1904: Miss M. M. Blakely, Miss J. A. Evans, Miss A. Fitzgerald, Miss E. C. Humphreys, Miss A. C. Jacob, Miss M. Pedler, Miss M. L. Potter, Miss L. A. Rideout, Miss M. M. Tunley.

Changes of Station:—

Matrons: Miss A. L. Cox, Connaught Hospital, Aldershot, to Shorncliffe; Miss M. C. S. Knox, R.R.C., Aldershot to Dover; Miss S. E. Oram, R.R.C., from Dover to the Cambridge Hospital, Aldershot; Miss G. M. Payne, R.R.C., Dover to Egypt; Miss H. W. Reid, Aldershot to South Africa; Miss E. A. Wilkinson, Woolwich to South Africa.

Sisters: Miss C. Anderson, Canterbury to South Africa; Miss A. Fitzgerald, Woolwich to Cambridge Hospital, Aldershot; Miss M. E. Harper, R.R.C., Shorncliffe to South Africa; Miss E. C. Humphreys, Woolwich to Cambridge Hospital, Aldershot; Miss R. Osborne, to Aldershot; Miss M. Pedler, Woolwich to Cambridge Hospital, Aldershot; Miss L. A. Rideout, Woolwich to Cambridge Hospital, Aldershot; Miss H. Suart, Netley to Cambridge Hospital, Aldershot; Miss M. M. Tunley, Caterham to Cambridge Hospital, Aldershot; Miss L. W. Tulloh, R.R.C., Alton to Canterbury; Miss M. Wright, Cork to South Africa.

Staff-Nurses: Miss A. R. F. Auchmuty, Netley to Cambridge Hospital, Aldershot; Miss S. K. Bills, Netley to Cambridge Hospital, Aldershot; Miss C. Mackay, Gosport to Woolwich; Miss S. Smyth, South Africa to Cambridge Hospital, Aldershot; Miss C. G. Stronach, Fermoy to Woolwich; Miss A. L. Walker, South Africa to Cambridge Hospital, Aldershot; Miss A. A. Wilson, Royal Herbert Hospital, Woolwich, to Royal Arsenal for temporary duty.

BIRTHS.

BULLEN.—On February 18, 1904, at Cannanore, Malabar Coast, India, the wife of Major J. W. Bullen, R.A.M.C., of a daughter.

HUGHES.—March 10, at Macmine Castle, co. Wexford, the wife of G. E. Hughes, late Capt. R.A.M.C., of a son.

MARRIAGES.

HENDERSON—THOMPSON.—On January 22, at St. Thomas's Cathedral, Bombay, by the Rev. Canon F. N. Hill, M.A., Capt. P. Hagart Henderson, R.A.M.C., youngest son of the late William Henderson, Esq., of Lawton, Perthshire, to Alice Ethel, daughter of the late General Charles Thompson, of Lonsdale, Bedford, and granddaughter of the late Admiral Thompson, of Longparish, Hants.

WHITE—CHURCHILL.—On February 6, 1904, at the Memorial Church, Cawnpore, by the Rev. G. E. Oldham, Harold P. M. White, 47th Sikhs, son of the late Philip James White, I.C.S., to Ethel, daughter of Col. C. F. Churchill, R.A.M.C., retired, of Dover.

SHANAHAN—YOUNG.—On March 15, at St. Peter's, Westminster, Major Donal D. Shanahan, R.A.M.C., to Henrietta Tarleton, daughter of Mrs. Young, 2, Knapton Terrace, Kingston.

DEATHS.

CAYLEY.—We regret to announce the death, on March 19, of Deputy Surg.-Gen. H. Cayley, C.M.G., aged 70. On his retirement from the Indian Medical Service he was appointed Professor of Military Medicine at the Army Medical School, Netley. The deceased officer was an Honorary Surgeon to H.M. the King. He was awarded the C.M.G. for his services in South Africa as officer in charge of the Scottish National Red Cross Hospital. An obituary notice will appear in our next number.

LEITCH.—On February 12, 1904, at 10, Rothesay Place, Edinburgh, Honorary Deputy Surg.-Gen. James Leitch, late Surg.-Major Army Medical Department, in his 80th year. He entered the Service on January 23, 1846, and retired September 26, 1874. He served in Bombay and Bengal; also in Jamaica.

HARRIS.—On February 16, 1904, at Brooke House, Upper Clapton, N.E., Honorary Brig.-Surg. William Henry Harris, late Surg.-Major Army Medical Department, in his 74th year. He entered the Service on March 10, 855, and retired September 11, 1880. His war services are as follows: Crimean Campaign, 1855—Siege and fall of Sevastopol; attack on the Redan of June 18; Battle of the Tchernaya. Medal with clasp and Turkish medal. Indian Mutiny, 1857-8—Operations before Calpee; capture of Lucknow; surrender of forts of Ahmatee and Thunkupore; subsequent operations in Oudh. Medal.

WESTON.—On February 21, 1904, at Sialkote, India, Capt. Herbert Ernest Weston, from meningitis, in his 27th year. He entered the Service on May 30, 1900, and was promoted Capt., May 30, 1903. He served in the South African War, 1901-2. Queen's medal with five clasps.

HERRON.—On February 23, 1904, at Victoria Hospital, Netley, Sergt.-Major Robert Henry Herron, Army Medical Service, aged 36 years.

REGULATIONS FOR THE EXAMINATION IN TROPICAL MEDICINE AND HYGIENE

CONDUCTED BY THE STATE MEDICINE SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE.

An Examination in Tropical Medicine and Hygiene will be held in Cambridge during the year 1904. The examination will begin on August 9 and extend over three days.

Any person whose name is on the *Medical Register* is admissible as a Candidate to this Examination, provided:—

I.—That a period of not less than twelve months have elapsed between his attainment of a registrable qualification and his admission to the Examination.

II.—That he produce evidence, satisfactory to the Syndicate, that he has diligently studied Pathology (including parasitology and bacteriology) in relation to Tropical Diseases, Clinical Medicine and Surgery at a Hospital for Tropical Diseases, and Hygiene and Methods of Sanitation applicable to tropical climates.

*** As evidence of study and attainments a Candidate may present to the Syndicate (1) any dissertation, memoir, or other record of work carried out by himself on a subject connected with Tropical Medicine or Hygiene; (2) any Certificate or Diploma in Public Health or Sanitary Science he may have obtained from a recognised Examining Body. Such evidence will be considered by the Syndicate in determining whether he is qualified for admission to the Examination, and by the Examiners in determining whether, if admitted, he shall be included in the list of successful Candidates.

The Examination will have reference to the nature, incidence, prevention,

and treatment of the epidemic and other diseases prevalent in tropical countries. It will comprise the following subjects:—

(1) The methods of pathological and bacteriological investigation. The examination of the blood. The characters, diagnosis, and life-history of animal and vegetable parasites. The examination, chemical and microscopic, of poisonous or contaminated foods and waters.

(2) The origin, pathology, propagation, distribution, prevention, symptoms, diagnosis, and treatment of the epidemic, endemic, and other diseases of tropical climates, including Malaria; Blackwater Fever; Trypanosomiasis; Relapsing Fever; Dengue; Yellow Fever; Plague; Tetanus; Beri-beri; Dysentery and Hepatic Abscess, Cholera, Enteric Fever, Malta Fever, and Specific Diarrhœal Affections of the Tropics; Diseases due to Cestode and other worms; Filariasis; Bilharzial Disease; Specific boils, Sores, and other Cutaneous Affections; Mycetoma; Ophthalmic Affections of the Tropics; Affections caused by poisonous Plants and Animals, and by Poisoned Weapons; Sunstroke.

(3) The general effects on health in the Tropics of seasons and climate, soil, water and food. Personal hygiene, acclimatisation. Principles of general hygiene, with special reference to food and water supplies, sites, dwellings, drainage, and the disposal of refuse. The sanitation of native quarters, camps, plantations, factories, hospitals, asylums, jails, pilgrim and coolie ships. Principles and methods of disinfection.

The examination will be partly in writing, partly oral, and partly practical and clinical. The clinical part will be conducted at a hospital for Tropical Diseases, at which cases will be submitted for diagnosis and comment.

Every Candidate will be required to pay a fee of six guineas before admission or re-admission to the Examination. A Candidate who, after being approved for admission fails to present himself at the Examination, will not have the fee returned, but will be entitled to present himself without further fee on *one* subsequent occasion.

Every Candidate who passes the Examination to the satisfaction of the Examiners will receive from the University a Diploma testifying to his knowledge and skill in Tropical Medicine and Hygiene.

All applications for information respecting the Examination should be addressed to Mr. G. H. F. Nuttall, Pathological Laboratory, Cambridge.

Candidates who desire to present themselves for the Examination must send in their applications on forms supplied for the purpose, and transmit them, together with the required evidence of study, and the fee of six guineas, to The Registrary of the University, Registry, Cambridge, not later than July 22. Cheques should be crossed "Barclay and Co., Ltd."

Cambridge,
February 13, 1904.

ROYAL ARMY MEDICAL CORPS ANNUAL DINNER.

The Annual Dinner of the Corps will take place on Monday, June 13, at the Hotel Metropole, at 8 o'clock precisely; the Director-General in the Chair. Officers intending to dine are requested to inform the Hon. Secretary as soon as possible, in order that the probable number attending may be known and that tickets may be sent.

All subscribers to the R.A.M.C. Fund, except any who may have expressly excluded the Annual Dinner in the allocation of their subscription, will be entitled to dine at subscribers' rates, provided that their subscriptions are credited to the R.A.M.C. Fund before the date of the Dinner. Also all officers who do not subscribe to the R.A.M.C. Fund, but who still subscribe to the former R.A.M.C. Dinner Fund.

The price of the Dinner to subscribers will be reduced as much as the Fund will permit, but the exact amount cannot be fixed until the number of subscribers attending is known. For the last few years the charge has been

12s. 6d. The amount should be paid personally at the Hotel on the evening of the Dinner.

The price to non-subscribers will be £1 15s., which must be sent by cheque or Post Office Order to the Hon. Secretary when applying for tickets. If the officer is unable to dine the money will be returned.

E. M. Wilson, *Lieut.-Col., R.A.M.C.,*
Hon. Sec. Sub-Committee, R.A.M.C. Dinner Fund.

5, Drayton Gardens,
South Kensington, W.

THE ROYAL ARMY MEDICAL CORPS FUND.

Notice of Second General Meeting.

The Second General Meeting of Subscribers to the Fund will be held in the Theatre of the Royal United Service Institution, on Monday, June 13, 1904, at 3 p.m. The Director-General, Sir William Taylor, K.C.B., K.H.P., will preside.

It is hoped that officers will freely express their views on any points connected with the Fund which they may wish discussed. The Director-General feels that this meeting gives him a unique opportunity of obtaining the real views of the Corps on the important subjects dealt with by the Fund. If subscribers will avail themselves of this opportunity for discussion it will facilitate the work of the Director-General and the Committee in administering the Fund according to the wishes of the subscribers.

He would specially draw the attention of subscribers to the Compassionate Fund, concerning which he hopes to make a statement.

Those officers who wish for information at the meeting on any special point are asked to communicate with the Hon. Secretary, in order that facts and figures may be collected to elucidate any question asked.

R.A.M.C. FUND.

Tenth Meeting of Committee.

The Tenth Meeting of the Committee was held at 58, Victoria Street, S.W., on Thursday March 3, 1904, at 3.30 p.m. Present:—

Surg.-Gen. Sir William Taylor, K.C.B., K.H.P., Director-General A.M.S. (Chairman).
Surg.-Gen. Sir John B. C. Reade, K.C.B., K.H.P., } Representing Retired
Surg.-Gen. H. Skey Muir, C.B., } Officers.
Surg.-Gen. A. H. Keogh, C.B.
Col. A. T. Sloggett, C.M.G.
Col. H. E. R. James.
Lieut.-Col. E. M. Wilson, C.B., C.M.G., D.S.O.
Lieut.-Col. R. H. Firth.
Capt. and Quartermaster C. Merritt.

(1) The minutes of the ninth meeting were confirmed.

(2) With reference to Minute 10 of last meeting, it was pointed out that the whole of the interest from the sum allocated to a Princess Christian Home is devoted to one or more men of the R.A.M.C., married or otherwise, according to the expense incurred.

(3) The Director-General read a letter of thanks from Mrs. De Chaumont for the recognition accorded to her late husband's memory, as indicated in Minute 11 of the last meeting.

(4) Lieut.-Col. Wilson asked if the Fund will subscribe £5 annually to the National Association for the Employment of Reserve and Discharged Soldiers. He pointed out that this was the best society for the purpose and that it had placed as many as 269 R.A.M.C. men; he also stated that no money was available for this purpose from the Canteen Fund at Aldershot.

The Committee voted a sum of £5 to the above Association for the current year only.

(5) It was noted that the sum of £828 19s. 3d. had been received from the South African Field Force Canteen (forwarded by the P.M.O., South Africa) for the Royal Army Medical Corps Compassionate Fund, to be divided between the "Widows' and Orphans' Fund" and the "General Relief Fund."

The Director-General had already written on behalf of the Corps and expressed his thanks for the donation.

(6) As the Aldershot Sub-Committee will at the end of the current quarter have a balance of £5 only for General Relief purposes, the Hon. Secretary asks for an advance of £20 to enable him to carry on. He points out that most of the payments are made on the first day of the month for which they fall due, and his balance will not provide for April payments. He further states that the expenditure is increasing monthly.

This question was discussed in connection with the general question of the Compassionate Fund set forth in Minute 7. The grant of £20 was approved, it being pointed out that it is desirable to exercise caution in the distribution of general relief until the funds have been placed on a satisfactory basis.

(7) The Director-General presented the following points for consideration :—

The Compassionate Branch of the R.A.M.C. Fund is at present divided into three channels :—

(1) The Widows' and Orphans' Fund—

At Aldershot, the balance at the disposal of this Fund was, on December 31 last	£830	5	3
The average quarterly expenditure last year was about	44	10	0
The highest was that for the last quarter, namely ..	60	0	0

(Incidental expenses are omitted in this calculation.)

(2) The General Relief Fund—

At Aldershot, the balance at disposal was, on December 31 last	£148	6	2

(Of this, £100 has been withdrawn for a Princess Christian's Home.)

The average quarterly expenditure last year, excluding incidental expenses, was..	66	9	0
The highest was in the first quarter	125	6	9
The balance at the end of the current quarter will be about	5	0	0

(Out of this Fund the sum of £10 per annum has been voted to the Corps of Commissionaires, and £5 has now been sanctioned as a donation to the National Association for the Employment of Discharged Soldiers.)

(3) The Charitable School Fund—

This amounts to	£1,390	12	1

(This has not yet been touched.)

The General Fund now possesses, besides the sum noted in 3, above :—

A, From interest on 3	£13	16	7
(Not yet allotted to 1 or 2.)			
B, From Nash Memorial	5	17	3
(Allotted to 2.)			
C, From Aldershot G.R. Fund	100	0	0
(To complete money for Princess Christian's Home, leaving balance of £16 7s., not yet ear-marked.)			
D, From Dinner (1903)	77	8	8
E, From S.A.F.F. Canteen	828	19	3
(For 1 and 2.)			
By taking from A	£13	16	3
By taking from B	5	17	3
By taking from D	16	7	0
By taking from E	28	19	3
making a total of	£65	0	1

we shall be provided with £15 for the two subscriptions noted above, and with £50 for General Relief for the next quarter.

The balance from the Dinner Fund (1904) should provide sufficient for General Relief for the third quarter.

The remainder of the South African money may then be placed on deposit

in order to increase our income, pending investigation of the situation by a Sub-Committee, which should be appointed as soon as the Director-General has collected material for it to work upon.

By this means the settlement of the question of providing funds for General Relief may thus be postponed for six months, during which period the Committee should be able to obtain a clearer insight into the probable needs of the Corps before making a finite allotment of the money from South Africa, and will further have the advantage of an expression of opinion from the subscribers at the second general meeting.

The Director-General further pointed out that it also remains to be seen what effect will be produced on the Funds by the establishment of a Cottage Home; this should relieve the General Relief Fund of at least one pensioner. Meanwhile it is desirable that caution should be exercised in the disbursements for General Relief, and with this view it may be suggested that the quarterly average for the last year be not exceeded unless calls be urgent. The Aldershot Committee, further, has been asked to furnish details showing the class of cases requiring relief, and also a statement as to whether any of these cases may be assisted by placing children at school, so that No. 3 of the above Funds may perhaps be brought into play for the assistance of deserving cases.

The Committee concurred with the Director-General's remarks and postponed the appointment of a Sub-Committee until further evidence has been obtained as to the requirements of the Corps. It was evident, however, that the General Relief Fund required the most anxious consideration to devise measures for its support in the future, and it was recommended that the Canteen Funds be asked to contribute to the Royal Army Medical Corps Fund for this purpose.

(8) It was suggested that a Memorial should be erected to an officer recently deceased. It was, however, agreed by the Committee that the object of the Memorial Fund was to perpetuate the memory of officers who had specially distinguished themselves.

While the Committee is prepared to arrange for memorials being erected for officers whose personal friends have made a special subscription for that purpose, it does so in order to save officers the trouble of arranging such matters when frequently disadvantageously placed for executing such work; but the object of the Memorial Branch of this Fund is to bestow its income as stated above, in memorising those whose services have been of an exceptionally distinguished nature.

March 4, 1904. B. SKINNER, Lieut.-Col., *Hon. Sec.*

"PRINCESS CHRISTIAN HOMES."

THE *Incorporated Soldiers' and Sailors' Help Society* is an Institution under Royal patronage and having as its President H.R.H. the Princess Christian of Schleswig-Holstein. Its objects are to help soldiers and sailors on discharge from the Service in obtaining employment, or by giving temporary relief; in time of war to arrange for the accommodation of convalescents; and to establish or maintain Convalescent Homes or Homes of Rest for discharged men who are disabled or necessitous. The Society is in possession of certain buildings at Portsmouth, Bisley and other places which are occupied by suitable cases; these are known as "*Princess Christian Homes.*" In addition to these, however, the scheme of help has been extended in a manner which is considered more advantageous in every respect—especially to the recipients. The deserving veteran is not removed from the town or village which he looks upon *as his home*; he is allowed to remain where he is (so long as his dwelling is "self-contained"), and assistance is provided for him by the Society in the payment of his rent, with an allowance for fuel and light. His house is then designated a "*Princess Christian Cottage Home.*" At the present time there are about 100 of these, and the number is only limited by the income of the Society. Endowment for some of these has been subscribed for by regiments for the benefit of their own men. In such cases, the Society, being

incorporated, is empowered to act as Trustees to administer the income. As above shown, the Committee of the R.A.M.C. Fund has fortunately been able to secure a permanent "Princess Christian Cottage Home" for the Corps. It should be noted that the Incorporated Soldiers' and Sailors' Help Society is working in harmony with all the other Military and Naval Societies, such as the Soldiers' and Sailors' Families' Association, the Disabled Soldiers' and Sailors' Society, &c. It also works in correspondence with the Charity Organisation Society; thus the danger of "overlapping" is avoided. A monthly record is published at the Society's address, 122, Brompton Road, S.W.

NOTICE TO SUBSCRIBERS.

OFFICERS are particularly requested to give timely notice of changes of station or changes of address, in order to ensure the posting of the Journal to its correct destination.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, &c. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts and commands at home and abroad. All these communications should be written upon one side of the paper only, and be addressed to the Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 68, Victoria Street, London, S.W.

Letters regarding subscriptions, non-delivery of the Journal, or change of address, should be sent to Major T. McCulloch, R.A.M.C., 68, Victoria Street, London, S.W.

Communications have been received from Col. J. Beamish, Lieut.-Cols. Whitehead, J. Hickman, J. E. Nicholson, Firth; Majors F. Smith, F. W. Begbie, F. Heuston, Leishman, T. du B. Whaite; Capts. J. H. P. Graham, J. West, H. Ensor, J. P. Bray, Statham. Major R. Ross, I.M.S.

In the event of reprints of articles being required by the authors, notification of such must be sent when submitting the papers. Reprints may be obtained at the following rates:—

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The following periodicals have been received: *The Medical Record, The Medical News, New York Medical Journal, Gazette Med. de Paris, Il Morgagni, The Medical Review, El Siglo Medico, Der Militärärzt, Deutsche Militärärztliche Zeitschrift, Anales de Sanidad Militar, Revue Med. de la Suisse Romande, La Medicina Militar Española, The Boston Medical and Surgical Journal, Annali di Med. Navale, Giornale del Regio Esercito, Le Caducée, The Hospital, The Ophthalmoscope, St. Thomas's Hospital Gazette, Bulletin de l'Acad. de Med. de Paris, Arch. Med. Belges, Voyenno Medisinskii, The Indian Medical Gazette, The Australasian Medical Gazette, Journal of the Association of Military Surgeons, U.S., Militarlagen ungwet af Militarlaegeforeningen,* J. Kjobenhaur, *The Veterinary Journal.*

VOLUME II. MAY, 1904. No. 5.

Journal

of the

Royal Army Medical Corps.

Original Communications.

THE "CURE" OF PHTHISIS.

BY CAPT. J. E. CARTER.
Royal Army Medical Corps.

PART II.

(*Continued from p.* 445.)

TEMPERATURE.

It is not too much to say that the successful treatment of phthisis depends on the reading and interpretation of the temperature chart. The knowledge gained by the use of the stethoscope is interesting to the physician, and may be to the patient, but to treat a case without a thermometer would be a mere groping in the dark.

It is essential then, to get the correct temperature, viz., the internal temperature, or as near to it as may be. The axilla temperature is, of course, useless. That of the mouth is most unreliable, unless taken with great precaution, and retaining the thermometer in the mouth, and under the tongue, for at least ten minutes; this may seem an absurdly long time, but I have found in my own practical experience that the mercury continues to rise often after five minutes, and no lower limit than ten minutes can be fixed, and even then the temperature obtained is not reliable. This will not, I think, appear so unreasonable,

when we consider the great changes of temperature to which the mouth is liable. Only on awakening in the morning (especially if one sleeps with the mouth shut) does its temperature approach that of the interior of the body. At other times, after being out of doors and keeping the mouth open (as occurs while talking), especially on a cold day, the mouth temperature will bear no ratio whatever to the internal temperature; and ten minutes cannot be considered too long an interval to permit of its regaining its proper ratio. Again, the mouth temperature may err in the opposite direction, and bear too high a ratio; as occurs after taking a hot drink, after mastication, &c.

It may be seen then, that the mouth temperature is very unreliable, and this method should never be employed if it is at all possible to employ the rectal method. The objection to this latter method is on æsthetic grounds, and perhaps these objections are natural; but I think that if the physician recognises the great importance of accurate records of temperature, he will find means to overcome these objections.

Before going further, I should like to refer to a popular expression, so common in this country, "normal temperature." We speak of it as if it were a hard and fast line drawn between health and disease; a rule for all, and for each separate individual. It is scarcely necessary to say that this is not the case. For, in the first place, what is the so-called "normal" temperature of one may differ to the extent of several decimal points from that of another. Again, to fix an arbitrary point, as the normal temperature throughout the day, is absurd; for apart from disease, the temperature during the day varies under many influences, the most important, of course, being bodily exertion of any form. Mental excitement, too, will raise the temperature. So also will sitting in the sun, &c., &c. The temperature of a healthy man, taken immediately on awakening in the morning, will be found to be far below "normal"—a degree Fahrenheit or more. If it is again taken after he has dressed and breakfasted, it will be found to have gone up to *his* usual day temperature. Now let him go for a long walk, and take his temperature immediately on his return, it will then be found to have risen to say 1° F., above the former reading. Now let him sit down and keep quiet for

half an hour, he will then find that his temperature has gone back to its usual height. In females, menstruation is the cause of a very erratic temperature, and as these variations occur a day or two before any discharge has begun to make its appearance, the physician must be on his guard, and try to obtain timely warning of their approach.

In Switzerland the Foehn wind (which is, I understand, identical with the Sirocco of Malta, and the Mistral of Southern France) will cause the temperature to stand somewhat higher than usual.

Having now cleared the ground, I can discuss the value of temperature-taking in phthisis.

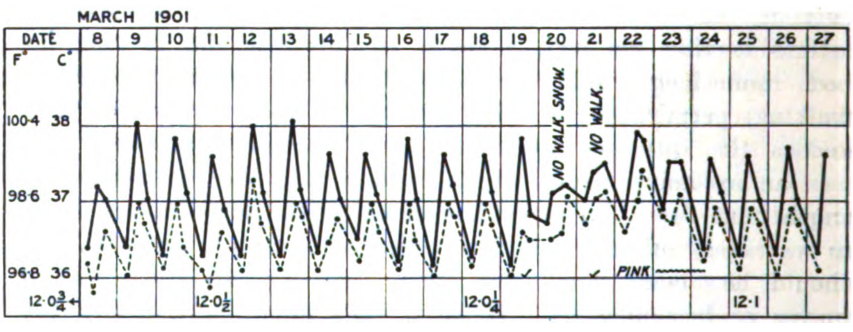
It would be incorrect to say that the temperature was the physician's guide, for it is his autocrat, and definitely lays down its laws, that such may be permitted and such not. For instance, any considerable rise of temperature forbids the patient leaving his bed, a lesser rise forbids him leaving his room and long chair. As regards the amount of exercise (walking) permissible, the temperature taken on return at once decides the question and pronounces whether the walk has been an excessive strain, or no, and if it is safe to extend its length next day. In general, as long as the temperature keeps up we cannot hope that the disease has been yet arrested, but when it has come down and remains so, we can hope it is in process of becoming so. What is very important is, that the temperature often gives timely warning (perhaps some days) of a recrudescence of the disease, or of some small foci breaking down, &c., &c., and this rise of temperature (at first very slight, may be) occurs, though no other physical signs may be apparent; this warning is very valuable, for by taking precautions beforehand, such as keeping the patient at rest, &c., much may be done to minimise the severity of the attack, and hæmorrhages are often thus prevented.

The following temperature chart is that of a fairly typical case, doing well, it will be seen to include a slight rise of temperature lasting for a few days, such as very often occurs.

The black line is the rectal temperature, the dotted line that of the mouth (the thermometer being left *in situ* for five and ten minutes respectively. The readings were taken on awakening, at about 7 a.m., at 12 noon, immediately on the return from a

walk of some five miles, and at 6 p.m., after an afternoon spent as one pleased, including a short stroll.

As regards the rectal temperature, I would draw attention to (1) the low morning temperature; (2) to the high midday temperature, taken immediately after the walk (which, however, falls on resting to its usual mark); (3) at 6 p.m. the temperature shown corresponds to the "so-called 'normal' temperature," being taken after an afternoon spent without any prolonged exertion. These readings are fairly constant, and are "normal" for this particular mode of life, but for another individual, or for another mode of life, they would not be so. As regards the mouth temperature, it may be seen how it varies and has no fixed ratio, except the early morning one, which is one decimal point below the rectal; the reason for



which must be, that at that time only does the temperature of the mouth approximate that of the interior of the body. The temperature after a walk is most irregular, although ten minutes were allowed in each case and every precaution was taken.

From my own experience, I have come to regard the early morning temperature as the most important, as this is the most unlikely one to be affected by outside influences, and in my own person I have found this reading to be the surest indicator of my own sensations.

Another method of taking temperature is employed by Dr. Huggard, of Davos. While making water he holds the thermometer longitudinally in the stream of urine. This is, I think, an excellent method to employ in the morning, when the

bladder is full, but at other times I think it is not so reliable. It possesses the advantage of being a very quick method.

Disinfection.

It may be taken that for all practical purposes a phthisical patient disseminates infection by his sputum, and by that means alone; patients, then, should always carry with them a pocket flask, and expectorate into it alone. The flasks should at bedtime be collected by a nurse, emptied and disinfected thoroughly. I would suggest that the flask be immersed for a considerable period, say overnight, in a 1 in 20 solution of carbolic acid, which is the best germicide for the tubercle bacillus. The sputum, before final disposal, should be allowed to remain for an hour or so, in equal parts of a similar solution. Such precautionary measures would naturally suggest themselves to all; however, they are not as a rule observed, even in our best sanatoria, a fact which I confess somewhat astonishes me. Spitting cups for night, used in the patients' bed-rooms, should be treated on similar lines. Dettweiller's flask is a very good and useful pattern of pocket flask, simple, and fairly easily cleaned.

Doctors and nurses, more especially if they handle sputum, should take every possible precaution; a mere perfunctory dip in carbolic lotion is of little practical good. A nail-brush should be always employed. One hears it often stated that nurses never contract the disease; like most popular statements, however, this is not, unfortunately, borne out by facts.

Bed-rooms of patients should be periodically disinfected, and no one should be put into a bed-room previously slept in by a consumptive without its being carefully disinfected. For this purpose spraying with chloride of lime (1 per cent. solution) is probably the best, surest and easiest method, all the surfaces of the room being carefully gone over. This is the method usually adopted in France. In Switzerland, formalin vapour is used. In our own country, strange though it may seem, no precautions whatever are adopted. I consider that this state of affairs should not be allowed to continue.

Measures Calculated to Prevent the Spread of the Disease.

Phthisical mothers should not suckle their infants. As regards infection from the ingestion of the meat and milk of

infected animals, such has been definitely proved to be the case as regards rodents. We have therefore inferred from this and from other hypotheses that infection can also occur in the case of man. However, as regards diseased animals, it is mainly the lymphatics and serous membranes that suffer, the fat and flesh being but rarely affected, comparatively speaking; a very common form is where the pleura is affected, which affection is commonly known as angle-berries, or grapes, on account of the arrangement of the nodular masses. When the meat of the animals so affected is exposed for sale the pleura is generally "stripped."

The two sources of danger of eating tubercular meat, as pointed out by the Royal Commission on Tuberculosis, are (1) that no cooking can destroy the bacilli imbedded in the interior of a joint unless it be a very small one, and (2) the danger arising from the knife of the butcher carrying infection from infected parts to those parts exposed for sale. This latter is not, however, a very real danger, as the infection in this case being on the outside, would in all probability be destroyed in process of cooking.

To guard against these dangers one measure is urgently required, and that is the abolition of private slaughter houses. All slaughter houses should be under Government control, and have an inspector, whose duty it would be to reject as unfit for human food any animal *extensively* affected with tubercle, more especially if wasted. Any animal with a "stripped" pleura should be rejected out of hand.

As regards milk, we, in this country, are agreed that before use it should be sterilised. However, there is considerable difference of opinion as regards the temperature to which it should be raised before it can be considered as inoccuous. This is probably due to the fact that the tubercle bacilli contained in milk are extremely virulent, much more so than the bacilli elsewhere. This fact has apparently been overlooked by some investigators, and they have conducted their experiments, with regard to the thermal death point of tubercle bacilli in milk, or sterile milk to which bacilli have been added. Their results, therefore, are of little value. As their thermal death point, 65° C. and 70° C. for twenty minutes have been given, but it is very doubtful if this is sufficiently high. On the whole, for

domestic purposes it is safest to bring the milk just up to the point of ebullition. Pasteur kettles, with their outside jacket containing steam, are also efficient, if properly used.

On this whole subject of human susceptibility to bovine tuberculosis Professor Koch has joined issue. He has experimented with young cattle, and found that he could not infect them with human tuberculosis. He then infers that the converse is true, viz., that bovines cannot infect man. But surely, at best this is only an inference, and as such cannot be accepted without proof; especially as all *à priori* proof seems to lie in the opposite direction. However, all statements made by him must be treated with the very gravest respect, and a Royal Commission is now sitting to enquire into the subject.

Koch has just lately brought forward a mass of statistics in support of his statement, and at the same time accuses us of inconsistence. He asks, why all this bother about milk, seeing that we do nothing as regards butter and cheese? Well, to start with, two wrongs cannot make one right, and again, these two substances do not form a constituent of an infant's food at that early age when it is so susceptible to abdominal phthisis. I confess I do not exactly see how we would proceed to disinfect butter and cheese, short of altogether discarding them as articles of food, a course which I for one would be very loth to do.

Cleanliness.

Absolute cleanliness should be enforced in the rooms inhabited by a phthisical patient. They should be daily cleaned out systematically. Although every precaution be taken by the patient, particles of sputum are liable to escape him, especially on coughing. These particles will eventually dry and become incorporated with the dust of the room, and will be quiescent until disturbed either by the wind or by mechanical means; when they will rise and float in the air, and thus become a source of danger to all who inhale them. Therefore, no dust must be allowed to accumulate, but must be got rid of daily by means of wet mops and dusters, to which the particles of dust will adhere. Brooms must on no account be used; in fact, they should never be used in any inhabited dwelling.

The number of germs in any internal atmosphere is sur-

prisingly small, but let the dust be raised, as by stamping on the floor, &c., and their number will be found to have increased a thousand-fold.

In the bed-room of a sufferer there should be as little furniture as possible, the surfaces of which are, of course, receptacles for dust. No carpets should be allowed, or at most a little strip alongside of the bed. There should be no heavy curtains; if any, they should be light and of a material easily washed. All necessary furniture should be light, so as to be easily movable, and raised from the floor, so as to permit of cleaning both underneath and behind. High wardrobes are an abomination, or any other high article of furniture, on account of the difficulty of getting at their upper surfaces. Cupboards contained in the interior of the wall itself are most excellent contrivances.

The floors should be closely fitting, with no cracks between the boards, failing this, linoleum is a good substitute. The walls should be either limewashed, or papered with waterproof paper, so as to permit of their being washed down at intervals.

As regards personal cleanliness, the patient should be enjoined to wash his face and hands frequently, but the subject of baths brings in a serious difficulty. Important though it be to keep the surface of the body clean, with all its pores open, so as to enable it to perform successfully its functions, still the danger of allowing a daily bath to every patient must not be overlooked. The exertion of taking a bath, and the subsequent drying, is much greater than one would imagine; besides, the raising of the arms above the head and violently using them, as one does in drying one's head and back, may occasion grave risk.

If a healthy man took his pulse both before and after his morning tub the acceleration would, I think, surprise him. A bath, then, cannot be always permitted a patient, and permission must always be first granted and precautions adopted. For instance, a patient may be allowed to bathe but not to dry himself, using instead a bath-towel dressing gown, which is an excellent substitute. Others must be content with a sponge down by a nurse, she herself drying the patient. A cold bath must be under no circumstances indulged in, more especially on account of the resulting increase of blood pressure. Dinner

napkins and handkerchiefs, if used, should be steeped in 1 in 20 carbolic lotion before being sent to the laundry.

Clothing.

This is a point on which there is not much to say, except to repeat the old motto, "Wear flannel next your skin." Heavy overcoats should not be worn when walking, on account of the extra "work done" in carrying them. Waterproofs should not be allowed. In many sanatoria no head-dress is worn; why, I do not know, and I can only account for it by the well known-fact that a reformer to be successful must also be a bit of a fanatic. This would also account for many extravagances which are (or were) committed at sanatoria. Bed clothing should be as light as is consistent with comfort, and no non-porous covering should be employed.

Mode of Life.

The correct life for a consumptive to lead has been well compared to that of a vegetable, and, I would add, to that of a highly manured and cared for vegetable. Both are given a superabundance of food and carefully guarded against any agency which may affect their material well-being. All the "force," all the "potential energy" of a patient should be expended on his bodily requirements, none should be "lost" on the brain. Therefore it is most important that a patient's mind be kept at rest and that he should have no worry or anxiety, and carefully excluded from anything likely to excite him, and the more nearly this life can be approached, *ceteris paribus*, the better will be the results. That this life can be more nearly attained in a sanatorium, than at home, is apparent. Visits from friends should be discountenanced. It is well known how they upset a patient, break into the routine, and the occurrence of more serious mischief, such as hæmorrhage, is by no means uncommon. Following on this, anything which is likely to excite the patient is "defence"; and so all games must be prohibited. Light literature only should be read, and letter-writing should be limited as much as possible. These rules refer only to serious cases, but with convalescents they need not be so rigorously enforced.

I can imagine one who has read of a patient's life at a sanatorium saying, "God help the consumptive," but if he

will contrast his present lot with that of, say, half a dozen years ago, when the patient's diagnosis spelt practically his death sentence, then I think he will alter his ejaculation to "God *has* helped the consumptive." That the life is "bad" at first, I grant; however, though difficult to believe, it is an undoubted fact that this life becomes quite liveable, and even negatively enjoyable, even for a man of active pursuits. And not the least of its pleasures lies in the feeling that day by day one is gaining ground and beginning to feel more like one's old self again. With this comes the feeling that it is, after all, worth living; that it is good to be alive, just for the sake of being alive. One learns, too, to revel in a glorious day, and for no other reason than just because it *is* a glorious day. "Mais il faut que nous revenons à nos moutons."

Medicines.

The modern treatment of phthisis is not a lucrative one for the druggist, and drugs are conspicuous only by their absence. The limits of this essay do not include the medicinal treatment of the disease, so I shall only name the drugs in common use.

Morphia is the sheet anchor in case of hæmorrhage, given at frequent intervals and with no sparing hand. Its *rationale* is to decrease the rate and depth of the respirations, lower the blood pressure and keep the patient quiet. As regards the other "internal hæmostats," such as ergot, gallic acid, &c., &c., their efficacy is very doubtful.

Heroin, an extract of morphia, is certainly a very useful drug in many cases, it being a depressant of the respiratory system, both local and central.

Hæmorrhages must also be treated with derivatives, and a combination of Epsom salts and Glauber's salts is as good as any. Some such gentle aperient as say, Apenta water, should always be kept readily available. In addition, an attempt should always be made to "abort" an incipient cold, and means for this end should be at hand.

Advantages of Going to a Sanatorium.

I had intended to go into this matter fully under a separate heading, but I have found it impossible to keep it apart from

my other remarks, and so I have already exhausted the subject; so it is only necessary to recapitulate.

First, I again repeat that I cannot too strongly urge on every case taking out a course, as it were, at a sanatorium. I consider this to be all important. There, and there only, can be learnt the hard lesson of what may be done and what must be left undone. So far and no farther. Here only can all the details of the proper life to lead be learnt, and it is on these details that success or failure depends. When all these details have been mastered, then the patient, if unwilling to remain longer, can with a fair amount of safety return home and treat himself, under medical supervision. I must admit, however, that on one point our sanatoria leave much to be desired, and that is as regards their feeding. That in this essential part of the treatment they should fail seems well nigh incredible, still such, however, is the case, and I can only account for it by thinking that the commercial element is allowed undue predominance. The fees charged are high, £5 5s. a week, so I think one might fairly claim to have the very best cuisine.

In the choice of a sanatorium I would give the choice to one built on the side of a hill, if sufficiently sheltered, for reasons already stated. I should also prefer one sufficiently remote from easy lines of communications, so as to render it at least difficult for relatives and friends to visit the patient; why, I have already discussed. Sanatoria on the sea-board I would not recommend, more especially if on the south coast.

Other points to consider are sanitation, comfort obtainable, and medical superintendence; this latter a very important point, as it is necessary for the physician to possess the complete confidence of his patient.

SICKNESS AND MORTALITY IN SOUTH AFRICA, 1859 TO 1898.

By Lieut.-Col. R. J. S. SIMPSON, C.M.G.
Royal Army Medical Corps.

The following notes on certain points have been prepared from the Army Medical Department Reports for the period, and the form is to some extent limited by the variations in the information given from year to year rendering it difficult to obtain a complete series throughout the whole period. This applies especially to the incidence of disease; more details are obtainable as regards the mortality, and accordingly, more attention is paid to mortality rates than to sick rates.

The figures refer to the whole South African command as it existed in 1898, that is, St. Helena is included with Cape Colony and Natal. The strength of the garrison there varied little during the whole period, and the sickness and mortality (with one important exception) has varied very much as that in the African Colonies, so that the inclusion of St. Helena has no material effect on the true African rates. As regards deaths, those of invalids have been included in the numbers.

Special Conditions Affecting the Health of the Troops during the Period.

(1) Operations in the field: (*a*) On the Eastern frontier, 1859-60; (*b*) Galaika war, 1877-78; (*c*) Zulu and first Boer war, 1879-81; (*d*) Matabele war, 1896.

(2) Annexation and occupation of the Transvaal, 1877-81.

(3) Imported disease. Malarial Fevers: (*a*) Between 1859 and 1867, particularly in troops from China; (*b*) throughout the period in troops from Mauritius; (*c*) throughout the period, but particularly in 1896-97 in troops from India.

Up to 1898 the only area in which malarial fevers are endemic, and in which our troops were operating, was the coast-belt in Zululand. This affects only the year 1879. Malaria, or "typho-malarial" fever, is indeed spoken of as prevalent on the Eastern frontier during the Galaika war, and in Natal and Zululand during the war periods 1879-81, but later experience shows that these local fevers were not in fact malarial.

(4) Syphilis has always been very prevalent at the Cape, except during the period of active control (see Army Medical Department Report, 1897, p. 505, Major T. Browning's report). It was markedly prevalent during the earlier years; it was and is often of a very bad type. On the contrary, venereal disease, especially syphilis, was never of great importance in Natal.

(5) Intemperance has always been prevalent at the Cape, where, as the late Surg.-Gen. J. B. Hamilton used to point out, a bottle of brandy is cheaper than a loaf of bread. As elsewhere, it was very common during the earlier years; and so late as 1873 one regiment paid £930 17s. 6d. in fines for drunkenness on a strength of about 700. The number of deaths from acute alcoholism itself, from delirium tremens and from apoplexy, were excessive during the earlier period; while murder, suicide, and the death penalty for murder, were not uncommon. Of late years there has been a great improvement.

(6) Age influence. It is not possible to obtain complete information on this point, but partial information is available for four years (1859-62) at the beginning of the period, and for seven years (from 1870-76), while complete information is available for Natal from 1891 to 1898. It would be as interesting as it is important to work out the febrile mortality as compared with the age composition, but the material is wanting for a complete statement. There is, however, enough from this and other sources to show that the year 1879 represents the division between the "old" and the "young" army, and that this difference really lies in the changes in the proportion of men "under 25" and "over 35"—the proportion between 25 and 35 years of age remains fairly constant. Roughly, the proportion under 25 has increased from 44 to 56 per cent., over 35 decreased from 12 to 3 per cent., while the intermediate ages show only a decrease of 3 per cent. In the years 1859-62 the figures available show, however, that about 50 per cent. were under 25, and 9 per cent. over 35. The increase in the febrile death-rate is greater than the increase in the proportion of young soldiers.

The Incidence of Disease.—It is proposed here to deal only with "clímatic disease." The period has been divided into eight sections of five years each, probably the shortest that can

be used satisfactorily for purposes of general comparison. The accompanying diagram (fig. 1) shows the incidence of the more important climatic diseases (malarial and continued fevers,

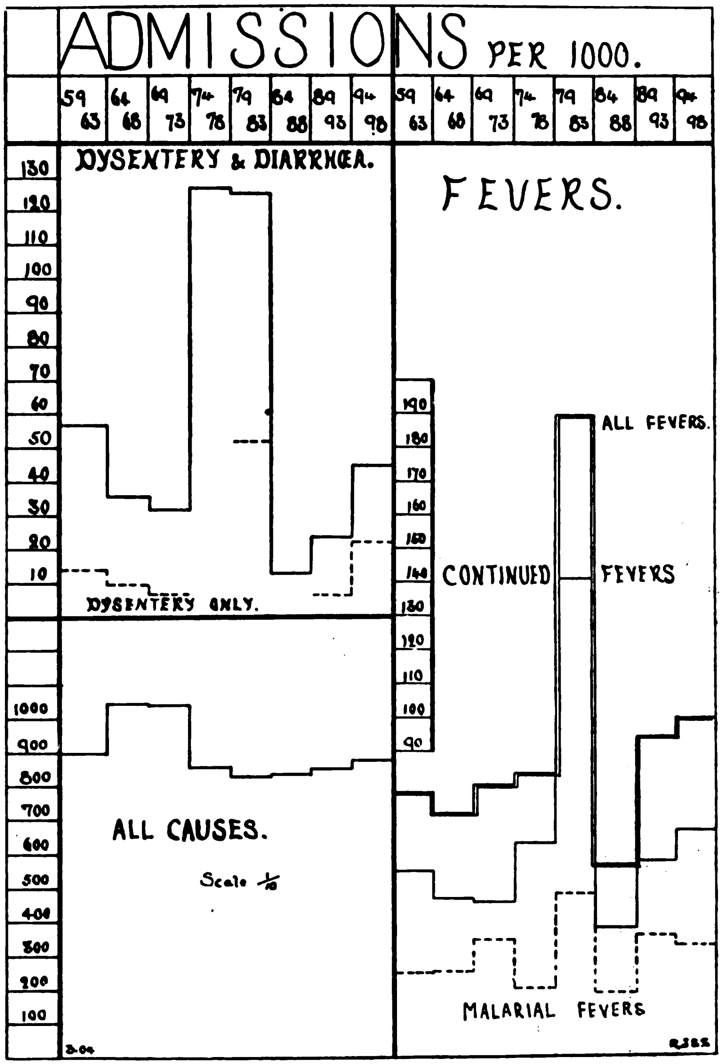


FIG. 1.

dysentery and its allies), and the incidence of non-malarial febrile disease is on the whole smaller during the first fifteen years than during the last fifteen. That the difference is not entirely a

matter of diagnosis appears from the comparison of the mortality rates for the same periods, which are relatively much lower for the first fifteen years, and decreasing in each successive quinquennium. Either the diagnosis of a "continued" as a "paroxysmal" fever was, in the earlier period, followed by a more successful treatment of the case independent of the diagnosis, or the incidence as well as the mortality from non-malarial fevers was considerably less than during the later periods. During the period 1884-96, for which comparative results have already been worked out (Army Medical Department Report, 1898, p. 490 *et seq.*), there was a distinct increase in the continued fevers during the last five years as compared with the first five years.

In connection with this it must be noted that the garrison during the years 1859-62 consisted to a considerable extent of comparatively young men (about 50 per cent. were under 25 years of age), a higher proportion than was found during the next eighteen years, and only about 5 per cent. less than the proportion at the present day. Now both the incidence and the death-rates are higher during the first quinquennium than in the second and third, while later, other factors came into play.

There appears to have been a steady improvement in the sanitary conditions during the period. In the earlier years there are not only reports condemning the drainage, buildings, accommodation, water supply and the rest, but there is actual evidence from the sick returns (apart from zymotic disease) that the conditions were unsatisfactory. The comparatively large number of deaths from tubercular disease may be due to the longer service, but contagious ophthalmia appears to have been a perfect plague for many years, and as late as the seventies. Now it does not exist. However, in spite of these unsatisfactory conditions, the incidence of non-malarial fever remained comparatively low.

St. Helena has been referred to as exceptional in one respect, and that is the steady diminution in the number of cases of continued fever throughout the whole period. Enteric fever is rare; only four cases occurred between the years 1884 and 1898.

The Continued Fevers.—The only way to get over the ques-

tion of diagnosis is to take all the continued fevers together; this is, however, less likely to be wrong in the mortality ratios than in the incidence ratios. One finds in the earlier years that the continued fevers are said to have been more frequent in regiments affected by malaria contracted elsewhere, so that some of these continued fevers may have been forms of malarial fever which did not conform to the type recognised as remittent fever. Hence the distinction between the malarial and continued fevers does not appear to be absolute. Similarly, one cannot say that all the deaths recorded as from malarial fevers, especially remittent fever, should in fact have been recorded as from enteric fever. In 1879, indeed, twenty-four deaths returned as from remittent fever are noted in the remarks as probably being, in fact, due to enteric fever, but on the other hand, from personal knowledge, two deaths occurred from malarial fever during the last quinquennium in which there was no doubt as to the non-enteric character of the disease. But on the whole, as regards the deaths, there is less probability of serious error in regarding them as all due to enteric fever than by attempting to differentiate between them. The incidence ratios are not quite so clear, and must be considered as approximate only.

As regards the continued fevers other than enteric fever, the so-called "S.C. fever" and the like, the whole evidence is to the effect that they prevail at the same seasons and in the same localities as enteric fever, and hence that the recorded distribution of the cases of enteric fever may be taken to represent that of the other continued fevers.

Enteric Fever.—The incidence in proportion to strength is much greater in Natal and Zululand than in Cape Colony. Between 1882 and 1898, of 1,130 cases returned as enteric fever, 966, or 85·5 per cent., occurred in Natal; 150, or 13·3 per cent., occurred in Cape Colony; the remaining small percentage in St. Helena and Rhodesia. The exact strengths in Natal and Cape Colony respectively are not available, but it is known that the strength in Natal was rather less than in Cape Colony, so that both the absolute and relative incidence is greater in Natal. Similarly, before 1882 most of the cases occurred in Natal or the Transvaal, though a complete numerical statement for the whole period cannot be made out. There is little doubt that about four-fifths of the cases of enteric fever in South Africa

(certainly between 1882-98) during the period occurred in Natal, Zululand and the Transvaal, that is, in the region of the summer rains.

With the exception of Eshowe, at which the maximum number of cases in a year has never exceeded four, and where the garrison in small, and Simonstown, as to which there is some doubt of its occupation by the army for the first few years of the period, cases of enteric fever have been returned

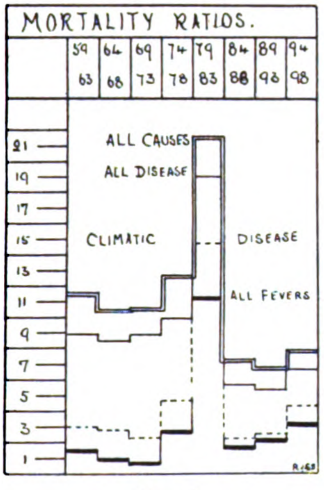


FIG. 2.

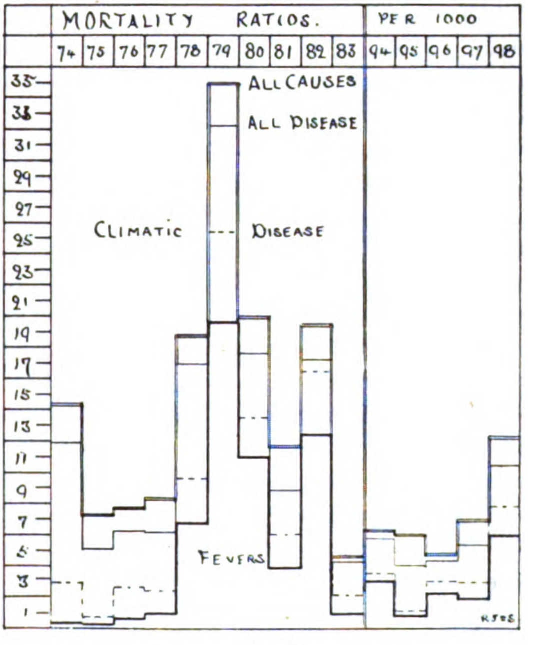


FIG 3.

from every station, permanent, new, or reoccupied, in which troops have been stationed during this period from 1882-98. Further, during the occupation of the Transvaal between 1877 and 1881, and the formation of small military stations in many of the towns, each of these contributed cases of enteric fever.

Dysentery and Diarrhœa.—Here the records are imperfect, and there appears to have been some confusion about diagnosis, judging at least from the number of deaths returned as from

diarrhœa during the earlier years. The incidence ratios for dysentery, and for this and diarrhœa combined, fell steadily during the first fifteen years of the period. During the last fifteen years the combined incidence rate has nearly doubled in each successive quinquennium, though the mean incidence rate over the fifteen years is about 12 per 1,000 less than in the first fifteen years. During the last fifteen years, however, the mortality is entirely from dysentery, about 0·26 per 1,000, while during the first fifteen years the mortality from dysentery alone was about 0·61 per 1,000, and from both diseases about 0·9 per 1,000, so that in this respect there is a marked improvement. Much of the dysentery during the earlier periods occurred in the troops from China, and was in all probability of a severer type than that now found. As regards the diseases associated with dysentery, hepatitis and hepatic abscess, it has not been possible to obtain the number of cases.

Mortality Ratios.—Turning to the rates of mortality, there is a very marked contrast between the variations of the total mortality (shown in the diagram, fig. 2) and those of the incidence ratios. The total admission rate during the war period 1879-83 is relatively the lowest in the whole period, while the mortality ratio is by far the highest, even excluding the deaths in action. The diminished admission rate was in all probability due to a diminution in the amount of venereal disease, but this point needs further enquiry.

With regard to the diagram, it is divided into two parts by the excessive death-rate during the war period, and this after some 32 per 1,000 has been deducted (due to "killed in action") to make them comparable with those in other periods. The right of the diagram shows the "young" army, the left the old soldier. Further, the table below, giving the details for the first fifteen as compared with the last fifteen years, emphasises the difference between these two periods. Here as elsewhere in the later period, the mean death-rate is lower, the death-rate from enteric fever has increased, the death-rate rate from other climatic disease (that is, dysentery and its sequelæ) has diminished, and there is also a very marked decrease in the death-rate from non-climatic disease, and a smaller decrease in that from "poisons," chiefly alcohol.

COMPARISON OF MORTALITY RATES, FIRST FIFTEEN YEARS AND LAST FIFTEEN YEARS.

	1859-63 Deaths	1864-68 Deaths	1869-73 Deaths	Total Deaths	Ratio per 1,000 of strength	1884-88 Deaths	1889-93 Deaths	1894-98 Deaths	Total Deaths	Ratio per 1,000 of strength
Malarial fevers	5	3	5	13	0·21	1	—	3	4	0·07
Enteric fever	1	11	3	15	0·24	27	35	82	144	2·37
Other continued fevers ..	31	10	2	43	0·69	1	—	—	1	0·01
Enteritis	1	—	—	—	0·02	1	1	2	4	0·07
Perforation of intestine ..	—	—	—	—	—	1	—	—	1	0·01
Dysentery	21	15	5	41	0·66	2	3	13	18	0·30
Diarrhœa	8	11	2	21	0·34	—	—	—	—	—
Hepatitis	7	10	14	31	0·53	4	—	2	6	0·10
Hepatic abscess	—	1	2	3	0·05	4	1	12	17	0·28
All climatic disease ..	74	61	33	168	2·71	41	40	114	195	3·21
Tubercular disease	36	38	35	109	1·76	12	5	18	35	0·58
Nervous disease	27	20	18	65	1·05	11	9	2	22	0·36
Circulatory disease	37	37	20	94	1·52	6	6	15	27	0·44
Respiratory disease	24	22	11	57	0·92	16	8	10	34	0·56
Digestive disease	11	3	1	15	0·24	3	3	1	7	0·11
Other diseases..	14	7	13	34	0·55	14	14	15	43	0·71
All disease	223	188	131	542	8·75	103	85	175	363	5·97
Poisons, including alcohol ..	24	15	6	45	0·72	—	1	3	4	0·07
Injuries..	41	31	20	92	1·49	29	22	26	77	1·26
In action	—	—	—	—	—	2	—	2	4	0·07
All causes	288	234	157	679	10·96	134	108	206	448	7·37

SUMMARY.

Ratios per 1,000 of Strength.

	1859-1873	1884-1898	—	+
Malarial fevers	0·21	0·07	0·14	—
Other fevers	0·95	2·46	—	1·51
Other climatic disease	1·55	0·68	0·87	—
ALL CLIMATIC DISEASE ..	**2·71**	**3·21**	—	—
Other diseases	6·04	2·76	3·28	—
ALL DISEASES	**8·75**	**5·97**	—	—
Other causes	2·21	1·40	0·81	—
ALL CAUSES	**10·96**	**7·37**	5·10	1·51
			3·59	

With regard to the different classes of disease shown in the table—

Hepatitis and Hepatic Abscess.—The increase in the mortality from hepatic abscess, with a concurrent decrease in that from hepatitis, is apparently due to a difference in nomenclature, not

to any difference in the respective frequencies of the two diseases in each period.

Tubercular Disease. — Part of the diminution is probably owing to short service, where the patient does not remain to die in the service.

Nervous Disease.—Probably partly due to the same cause, especially with the greater prevalence of intemperance in the earlier period.

Circulatory Disease.—In the earlier period aneurism was even more frequent than heart disease; in the later period it has disappeared.

Respiratory Disease.—Mainly pneumonia, with pleurisy and empyema, and some bronchitis.

Digestive Diseases.—Mainly gastric complaints in the earlier period, partly explained by the longer service also.

Poisons, including the most frequent cause, Alcohol.—Acute alcoholic poisoning, as well as delirium tremens, appears frequently during the earlier period.

It happens that the last quinquennium of each of the two parts into which the mortality diagram is divided immediately precedes a war period, and in each there is a rise in the total death-rate, an increase which is seen in each class of disease. Hence it appeared advisable to examine these two periods in greater detail. The results are shown graphically in fig. 3.

In 1877 the Transvaal was annexed; new stations were opened both in Natal and the Transvaal. In December of the same year the troops crossed the Kei river prior to the beginning of the Galaika war. During that campaign a so-called "bastard" form of enteric fever, called by some "typho-malarial" fever, prevailed among the troops engaged. It began almost simultaneously in East London, King William's Town and Fort Beaufort, and gradually extended to the camps in the Transkei and Ciskei. Most of the cases occurred in March, April and May, 1878.

In August of the same year preparations were begun in Natal in view of the serious trouble with Zulus, Wood's column went to Utrecht in the same month, and an expedition was sent against Seccocoeni. All these movements had the usual sequela, an increase in enteric fever. In 1879, admissions are stated to have occurred at nearly every station (in Natal,

Zululand and the Transvaal) and on the line of march. Durban was said to have been a great focus for the distribution of the disease. The detailed medical history of the war shows the persistence with which enteric fever stuck to an infected body of men, though other explanations have been put forward.

In 1880 cases and deaths from enteric fever occurred at most stations in Natal and the Transvaal, most in the first quarter of the year.

War was declared on Dingaan's day, December 16, 1880, and small garrisons were besieged in Standerton, Marabastadt, Wakkerstroom, and Potchefstroom. Reinforcements arrived from England and India between January and May, 1881, and about 7,000 were encamped at Newcastle between March 23 and the end of May, 1881. One of the most curious features of the case is the extraordinarily small incidence and mortality during this year as compared with the preceding and succeeding years. The only explanation that suggests itself is that as the reinforcements only began to arrive on January 21, and continued arriving till May 15, the greater part of them arrived after the season of greatest prevalence of enteric fever had passed. It may be noted here that the meteorological records show that in the last three months of 1880 the rainfall at Fort Napier, Maritzburg (which is fairly typical of that in Natal generally), had been much *above* the average, and that the fall in January and March, 1881, was about the average, the February fall being a little short. Now an examination of the conditions associated with the prevalence of enteric fever in Maritzburg seemed to show (Army Medical Department Reports, 1898) that a good and early rainy season was associated with a shortened enteric season, and conversely.

In September, 1881, some cases of enteric fever occurred among the troops encamped at Newcastle, and thence the disease gradually spread all over Natal. The date of appearance was comparatively early. One may note here also that the August rainfall was considerably above the average, which is usually small; later it was about normal.* A full account of this outbreak is given in the Army Medical Department Report for 1881, by Brig.-Surg. Wm. Skeen, M.D., and is most interest-

* The rainy season does not begin till the beginning of October.

ing. In 1882, 240 cases of enteric fever, with 47 deaths, are reported from Natal, none from Cape Colony.

In 1883 the garrison was much smaller after the withdrawal of the reinforcements, and the troops remaining were "acclimatised"; the result was an exceedingly low mortality from climatic disease, including all fevers; the soil had become exhausted. With this was coupled the lowest admission rate for all diseases occurring during the whole forty years (651·2 per 1,000).

In the period preceding the last war we find the same increase, but on a smaller scale. In 1897 there was a large increase of the garrison, and two stations, King William's Town and Ladysmith, were reoccupied. In the first the old barracks were available, in the second hut barracks were erected, as also in Maritzburg. In 1898 a further increase of the garrison took place, so that the average strength in that year was nearly double that in 1896 (increase 88 per cent.), while the accommodation was increased as stated above. Following this, in 1898, we have an increase in the rate of mortality from fevers similar to that occurring under similar circumstances twenty years previously, and probably only less, both relatively and absolutely, because no operations in the field were undertaken during this last period.

It is, of course, possible to lay too great stress on the connection between the increase of the garrison and the increase of the mortality rates. There is much reason to believe that the prevalence of enteric fever in Natal in 1897-98 was not solely determined by the advent of fresh troops, but (like that in 1891) was partly, if not considerably, influenced by climatic conditions, that is, by a shortage of rainfall during the two years preceding (*vide* Army Medical Department Reports, 1898, p. 490 *et seq.*). It would appear to be more than a coincidence that the prevalence of enteric fever in the Galaika war of 1878 was preceded by a drought in Cape Colony in 1877.

But even allowing for other factors, a comparison of the rates of mortality with the annual strengths suggests that an important increase of strength is associated with an increased rate of mortality, and this irrespective of actual war conditions. This is probable on general grounds: granted a country where enteric fever is endemic, where the barrack accommodation is

only calculated for a small garrison, so material an increase as occurred in South Africa during these two years must cause a strain on the existing arrangements. When one considers the actual position in South Africa, where certainly during the years preceding the last war, and apparently also during the period preceding the Zulu war, if not during the whole interval between the two campaigns, all expenditure on military works was influenced by the idea that the garrison would be materially reduced at no distant period, one can easily understand that the existing accommodation had become deficient in many of the details recognised as necessary for the maintenance of proper health conditions, even in the small garrison then present; and further, that the plans for the additional accommodation, which had to be provided with the increase of the garrison, were prepared under the influence of the same idea—early reduction—and were therefore of a temporary and inadequate type.

It is somewhat paradoxical, but probably correct, to say that the health conditions in South Africa have been very materially influenced for the worse by the magnificence of its climate. Trusting to this, liberties have been taken there in sanitary matters that would not be tolerated elsewhere, and this laxity is not confined to the civil population.

THE TREATMENT OF SEPTIC GUNSHOT FRACTURES OF THE FEMUR AND OTHER LONG BONES.

By Lieut. W. F. TYNDALE, C.M.G.
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Compound fracture of the femur in its upper part has been fairly common as the result of bullet wounds during the South African campaign. In a good many cases the wounds have been septic and often the comminution of bone very great. These septic fractures have a high mortality, and as regards their treatment considerable difference of opinion exists.

In the course of the campaign, and particularly in the early part of it, I had under my care a large number of these cases, and could also watch the treatment of other medical officers under similar circumstances. A great source of error amongst many of us, especially in the earlier cases treated, was to regard them from the same standpoint as compound comminuted fractures of the femur seen in civil practice, the results of accidents. The two conditions are essentially different, and the last certainly the more serious. In a compound fracture produced by an accident in civil life, the force being usually from without inwards and of a crushing character, the bruising of muscles and the injury to the vessels is considerably more serious than in those compound fractures produced by bullets, in which the damage is from within, the splintering of bone causing the chief damage to vessels; in addition, although the extravasation of blood may be great there is not such wholesale damage to tissue. This point is worthy of note because it influences the question of immediate amputation. Often, in civil cases, the damage is so great that it is evident the limb will be of little use even if the patient escapes gangrene and other complications.

In my opinion, however great the comminution of bone in a gunshot wound, provided the man survives, it is nearly always possible to obtain a limb of some use, with the proviso that not more than three inches of the bone are actually driven out or removed, which first rarely occurs in gunshot wounds. That men have recovered from septic compound gunshot fractures of the thigh with a flail leg is true, but in many cases this is due

to the removal by the medical officer of large pieces of bone which, being felt loose and separated, have been removed to allay the suppuration, *i.e.*, as the cause of it. I have seen operators insert long forceps into a wound and remove pieces of bone of large size which I subsequently examined and found still covered with periosteum, but which felt to the finger in the wound to be quite loose and separate from the shaft. I have done this myself. I have come to the conclusion that the removal of any pieces of bone at an early stage, unless very far removed from the shaft, is a mistake and usually unnecessary. It is marvellous how these pieces will weld together in time, also how few necrose, and although one feels with the finger bare bone, apparently denuded of periosteum and quite separated, in time, after only slight loss of its substance, it will become united with other pieces often in a similar condition.

Amputation above the middle third of the thigh in cases which are septic and have been so over a week is almost invariably fatal. Two alternations are advocated if amputation is essential: (1) Amputations within forty-eight hours of reception of wound. This, on the field or even in a field hospital, is a very serious undertaking and should, as a rule, only be undertaken if there were grave fear of gangrene or for a few other critical conditions. The fact alone of the wound commencing to be septic would hardly justify amputation on the field (that is, whilst still with a bearer company or convoy). (2) To wait until the wounds are healthy, until the patient is in the best of health possible, in the best surroundings, and then under these conditions to amputate.

In both these alternatives the risk is very great and the mortality high. These septic gunshot fractures if energetically and properly treated do remarkably well, and there should be but few cases in which amputation is ultimately necessary. To give an example of the worst type of case: A trooper was admitted to hospital with a gunshot wound of the upper part of the right thigh. He had been dressed once on the field, by a friend, I believe, and once subsequently at an out-station. When admitted the wound was a week old, suppurating profusely, and stinking. Under an anæsthetic the upper part of the femur, including the great trochanter, was found to be shattered, the splintering being longitudinal as well as transverse in direction, the bone being powdered in parts and loose pieces lying about in the neighbouring muscles.

The upper part of the femur, in fact, was in four or five pieces, with the part immediately where the bullet had struck either powdered or in fragments varying in size from a pea to a walnut, and extending longitudinally over two and a half inches. In addition, the wound was suppurating profusely. The man's temperature ranged between 101° and 103°. This apparently was a hopeless case ; œdema and redness extended well up the buttock, and it appeared highly probable that suppuration would shortly extend to the pelvis and abdomen up the intermuscular layers of tissue.

One need not here describe his particular treatment, which was very much on the lines described further on. The high temperature continued with very little remission for three weeks or more, operations were frequent, the patient wasted extremely, and the amount of pain involved in his treatment very great; the question of amputation was mooted to give him "his only chance." The discharge was extremely profuse and extension of suppuration occurred in all directions, requiring frequent and free incisions. The treatment was maintained, and at the end of a month the temperature began to range lower, the fracture showed signs of uniting, the discharge became thinner and less foul, though still profuse. Practically *no* bone was removed throughout. The man made a good recovery and ultimately got off with about two inches shortening, and, I believe, a small sinus.

As to the treatment of these cases : On admission to hospital, the case being found to be septic, an anæsthetic should be given as soon as possible, and the wound carefully explored with the finger (the surgeon operating must be the surgeon who carries out the subsequent dressings, the practice of one surgeon operating and another surgeon subsequently attending to the case is unfair both to the patient and to the surgeon in charge of him). Loose pieces of bone lying in muscle and with tissue separating them from the shaft should be removed at once ; pieces of bone lying near the shaft with no intervening tissue should be left (it is not always possible to discover with the finger that these have lost their blood supply, *i.e.*, are denuded of periosteum, and unless they are very small they should be given a chance). The exact position of the loose fragments should be felt and remembered, as this often gives a clue to subsequent increase of suppuration.

A longitudinal incision, at least three inches in length, should be made at the back of the thigh down to the fractured portion of bone, and carried round the bone, establishing communication with one of the original wounds. One large, or better two (half an inch in diameter), indiarubber tubes should be passed through from the front or laterally to the posterior incision (if there is a large cavity in the bone pass the tubes through it if possible). Wash out thoroughly with warm (1 in 40) carbolic solution—temperature 116° F. The posterior incision should always be made in these cases, it is impossible to secure good drainage without it. Generally it will be found necessary to enlarge the point of entrance or exit of the bullet. All cavities felt by the finger likely to allow pus to accumulate should be connected with the posterior incision either by drainage tube or by incising intervening tissue. Copious dressings should be applied. An X-ray photograph should be taken generally within the first twenty-four hours, if possible. If the bullet is still in the body, and has been localised about the neighbourhood of the fracture, it should be removed. If, however, it is lying at all away from the septic area and is doing no harm, it is bad practice to incise the healthy tissue in order to remove it; the probabilities are that the fresh wound will also become septic. Care should be taken in drawing conclusions from the X-ray photograph as to the positions of the fragments of bone as regards one another and with regard to the shaft. These skiagrams are very deceptive, much depending on the angle at which taken. Most erroneous ideas of the nature of the fracture may be drawn from them. Further reference to X-ray pictures is made at the end of this article.

In the subsequent treatment, splints, as a rule, are not required; they give great additional pain in dressing and should be avoided as much as possible. Even an extension is rarely necessary, the exception being usually when there is no comminution. *Shortening through muscular contraction is the rarer the greater the comminution.* "Jumping" of the muscles is rare with comminution. It must be borne in mind that the condition of the patient is so serious that saving his life must be the first consideration, saving the leg the second, whilst the question of shortening must be relegated to the background. In badly comminuted fractures of the thigh, it will be found that if the leg is laid in position between sand-bags, that there is very little tendency to shortening after

the first forty-eight hours. If splints are discarded, dressings are more easily applied; it is easier to irrigate the wound, there is less pain, since the splint often presses on the wound or its neighbourhood, no splint sores (these are usually impossible to prevent when splints have to be taken down once or twice a day, and when the patient is wasted and septic), no pain from taking off the splint, and continuous irrigation will be possible, whereas with a splint it is impossible.

Difficulty will occur at first in using the bed-pan, but mechanical extension from the foot, during its use, minimises the pain, and it is astounding how quickly the patient gets callous to the leg being handled and moved. It is well not to be too sympathetic with these patients. Prolonged fever, weakness and pain tends to make them highly hysterical, and unless great firmness is shown both by the nurse and medical officer it will be found impossible to carry out the treatment properly, and almost certainly a fatal termination will ensue. In the worst cases irrigation twice a day will be found to be quite inadequate. It will make no appreciable difference in the amount of suppuration, the rapidity of the extension into surrounding tissues, or impair appreciably the general condition of the patient by diminishing septic absorption. It only remains in these cases to contrive some form of apparatus which will allow continuous irrigation to be carried on for many hours, or throughout the day.

From the results of cases treated energetically in this manner, I consider that its adoption gives the best results, and in many cases offers the only chance of life to the patient. If efficiently performed it will allay the most virulent forms of suppuration. For its efficiency, intelligent co-operation on the part of the nurse or orderly is required, patience on the part of the medical officer, attendant and patient. Time after time it will be found that the irrigating fluid has been sucked up the back of the patient, and that the whole bedding is soaked, and artful contrivances must be improvised to prevent it, the carrying out of which will depend largely on the ability of the nurse. For example, I have irrigated successfully thighs with wounds as high as the folds of the buttock without, after the first trial or two, any water escaping into the bed.

The best antiseptic to use is half a drachm of tincture of iodine to one pint of hot water (temperature 116° F.). To maintain the

water at a high temperature is the most important consideration. The rate of flow should be three pints to the hour at least, and so contrived that the fluid reaches every possible part of the bone and surrounding cavities, two irrigators being used if one is not sufficient. Preliminary rapid irrigation should be done every day and the wound explored with the finger at the same time, if the patient can stand it (the patient will often become tolerant of this in a day or two), if not, under an anæsthetic every second or third day. The duration of the irrigation each day depends greatly on the patient and the nature of the fracture. Some cases will suffer no inconvenience from it, and in fact like it, others after one hour or so at the onset of treatment will complain of pain usually from the nozzle of the irrigator in the wound. It is best then to discontinue the irrigation for a time, gradually lengthening the period each day.

The treatment must not be given up because no immediate diminution of temperature takes place. The temperature may keep as high as previously for seven, ten, or even fourteen days, and even, as in the case of a septic fracture of the humerus under my own care, until after some union has taken place. A more important point is whether the surrounding œdema and redness are diminishing, stationary, or extending, or, as in very septic cases further sloughing of the muscles takes place, whether pus is still "eating out" pockets in the tissues, and whether the wound is markedly less fœtid. The temperature is only a small consideration at first as to the effectiveness of the treatment. The best arrangement for carrying out continuous irrigation in fractures of the thigh is to slope the bed by placing hernia blocks under the upper end and allowing the water to flow into a pail at the foot. The other method of allowing the water to run through a hole in the bedding into a pail beneath is only possible in fractures of one bone of the leg, not the thigh, because of the pain produced at the seat of fracture by having practically no support under it, and by the difficulty in keeping the water out of the bed. In the first method, the patient is placed with a ring air-pillow under the buttocks and jaconet is fixed by strapping across the tips of the buttocks and carried down to just above the posterior wound. A mackintosh sheet passes from the foot of the bed up over the ring pillow. The slope of the bed is made about one foot in six or more. Padding is placed under the leg between the pillow

and the fracture, beneath the mackintosh, and so arranged that the leg lies evenly on the mackintosh and with no antero-posterior bend at the seat of fracture. Laterally the mackintosh is carried over the sound leg on one side and over sand-bags on the other, forming a trough sloping down to the foot of the bed. A cradle can be placed over all and the other leg and body kept warm with blankets, one of which can be carried over the cradle.

Patients bear the actual treatment extremely well. There is no exhaustion or collapse, and it is quite possible, if necessary, to keep the irrigation going continuously. I have done this in a gunshot fracture of the fibula in which the septic process was most intense, whole masses of muscle sloughing in a few hours, and had an excellent result; but I have not done it in femur or humerus cases, finding six to twelve hours in the twenty-four sufficient. The actual preparation of the patient for the process is generally at first accompanied with pain, but as there are no splints to take down, the actual movement is limited to placing the mackintosh, &c., into position. Pain, from digital exploration, which, as before mentioned, should be done daily if possible, gradually diminishes as the patient gets accustomed to it. The larger the irrigator used the better. It can be easily suspended from a screen. An orderly must attend to it every fifteen or twenty minutes to insure the temperature of the water being maintained. The rate of flow can be controlled by a stopcock, or if that is not available, by string tied round the tubing. The end of the glass nozzle in lateral wounds must be inserted into the wound, but if on the upper surface, the nozzle can be fixed with tapes so that the point is immediately over the wound. It is best, however, to insert the nozzle and alter the position from time to time. The whole wound should be covered with lint dipped in a solution of 1 in 20 carbolic acid, a hole being made through it for the nozzle of the irrigator. I consider on the whole that it is better to remove the drainage tubes before irrigation, as they often prevent the fluid diffusing over the tissues, conducting it straight through; however, if removal causes much pain they can be left *in situ*.

The use of hot-water baths is of course mechanically impracticable as regards fractured femur cases, and also generally in fracture of the tibia. In fractures of the humerus as well, especially of the upper end, it is impracticable; even if practicable it is not to be preferred, as the current of water properly directed gives

better results in cleaning up the wound and in preventing extension of suppuration.

In exploring septic wounds to discover fresh tracts of suppuration great care should be exercised. Indiscriminate incisions into healthy tissue through the old wound will render that tissue septic, and it is common to see, instead of improvement, a still higher temperature within forty-eight hours. Increase of temperature in the patient with a septic fracture is by no means a positive sign of extension of suppuration in the soft tissues. I have frequently myself on the strength of a rise in temperature explored a wound and made incisions in neighbouring tissue, especially in slightly œdematous parts, expecting to find pus and have found the tissue quite sound. The signs of extension of suppuration in this class of case are very uncertain, œdema, perhaps redness *plus* a rise in temperature are the most certain indications, but by no means infallible. For example, I had a case of septic gunshot fracture of the thigh about the junction of the middle and upper third, the patient had a fairly high temperature, gradually descending after about ten days' irrigation. On the fourteenth day the temperature rose for no apparent reason to 103° F., on the sixteenth day œdema and some redness appeared in the upper part of the popliteal space, four inches from the wound, with apparently healthy intervening tissue; next day the part was markedly swollen. Mr. Makins then saw the case and advised waiting a short time, and then, if the symptoms did not abate, exploring the swelling. I ultimately incised and found absolutely nothing to account for the signs. The patient's temperature gradually descended and he ultimately recovered. Probably the true cause of the rise in temperature was an increase in the suppuration about the fracture and some retention of the pus which ultimately was washed away unnoticed in the continuous irrigation.

I have neither seen or heard of secondary hæmorrhage occurring in cases treated by continuous irrigation, although I have seen several in ordinary septic cases not so treated. I do not infer that this is a proof that secondary hæmorrhage cannot or does not occur in continuous irrigation, but maintain that the process certainly does not tend to increase the liability to sudden hæmorrhage; however, although I have not seen it occur, it is wiser to have a special orderly over the patient whilst irrigation is going on. Treatment by continuous irrigation has been prac-

tised in septic conditions for several years now, but its systematic use in these dangerous cases of gunshot fracture has, so far as I know, not been very frequently attempted. You have in this class of case a condition in which amputation is generally impossible on account of the debilitated state of the patient, so that the alternative is to strive by every possible means to prevent the extension and continuation of septic processes. Theoretically, continuous irrigation presents the greatest possibilities, and I think from my own experience it will be found practically to be the most efficient means of treatment. The main point is not to be soon disheartened by the difficulties in carrying it out, they are more apparent than real, and can be overcome ; also to remember that it is the life of the patient that has to be saved and that, under the circumstances, questions of treatment for shortening, &c., must be disregarded, if the man's condition is critical, as it is generally in these cases.

As regards subsequent shortening in these cases, it may be said that it varies considerably in degree within limits. Measurements should be taken two or three times a week. If, in a particular case, it is at all excessive, that is, two inches or more, a skiagram should be taken to ascertain whether the fragments are overlapping or forming an angle with one another. With care, this should rarely happen with much comminuted fractures. To place the leg in splints or use an extension because there is shortening alone, without first ascertaining its actual cause, is bad practice. Shortening will take place in these cases, without either overlapping or angular union, and in this class an extension is likely to do more harm than good, delaying, if not preventing, union, besides considerably interfering with the treatment of the septic condition. Should there be overlapping or an angular position of the fragments, the treatment must depend almost entirely on the septic condition of the wound, and also on the bone fractured. For instance, considerable shortening of the humerus can occur without much subsequent inconvenience to the patient, and consequently that condition may be left without treatment, if by doing so the chances of saving the limb are at all improved. If it is found by X-rays that there is overlapping in a case of fractured femur, splints and extension may be tried for a time ; however, if the patient gradually goes down hill, and suppuration extends, the splint or extension or both must be dis-

carded and the shortening must take its chance. Whenever shortening is more than two and a half inches, some or the greater part of it is due generally to overlapping produced by muscular spasm; an extension applied for forty-eight hours will usually overcome this, and the extension can then be discarded. Shortening to the extent of four inches or more, if permanent, is generally the result of bad treatment or want of care on the part of some one. Such shortening, if discovered early enough, can almost always be considerably reduced.

SOME REMARKS ON ARTEREO-VENOUS ANEURISM, WITH ILLUSTRATIVE CASES.

By Major S. F. FREYER, C.M.G.
Royal Army Medical Corps.

Artereo-venous aneurism of the large vessels is no longer to be looked upon as a rare complication of wounds in battle. This is one of the changes coincident with the adoption of the mantled small-bore bullet of high velocity. In fact, in the recent war in South Africa this peculiar lesion of the blood-vessels was probably as common as the simple arterial aneurism. For instance, at No. 4 General Hospital, Mooi River, we received 13 artereo-venous, as compared with 7 simple arterial, aneurisms in a total of 2,775 wounds in action. The term "simple" would seem very applicable to the latter class in contradistinction to those dealt with here, not only as regards their pathology, but also with reference to their prognosis and treatment.

The cause of this comparative frequency of artereo-venous aneurisms nowadays is not far to seek. It will be observed that, in a general way all over the body, the main veins and their accompanying arteries preserve, in the same plane, a relative antero-posterior position with reference to each other, while this also is the direction in which the bullet traverses the body in the great majority of cases. It is one of the best illustrations of the great penetrating power of the modern bullet, and of its tendency to cut its way indifferently through every structure met with in the body, without any appreciable displacement of the parts. Indeed, in more ways than in the production of artereo-venous aneurisms do these wounds recall those caused by the thrust of the sharp foil.

In the following cases it will be noticed that when recurrent bruit set in after operation it was not noticeable for about a week. This fact was carefully observed in more than one instance by stethoscopic examination after undoing the dressings. No deduction, however, can be drawn from this as to how soon bruit appeared after receipt of the wound. There is not, it would seem, in these cases any great tendency to severe primary hæmorrhage and so the "first dressing" would remain undisturbed. In some such way, perhaps, their greater relative

frequency amongst the aneurisms that arrived at a general hospital for treatment may be explained.

Interesting as these aneurisms are in their mode of production, and in their extraordinary and quite pathognomonic thrill and bruit, it is their prognosis and treatment that should most concern us, and in regard to the latter more particularly the operative treatment. It is because at the present time there seems some doubt as to what is the best operative procedure in these cases, that it is hoped the details of the following four cases may prove interesting.

These cases are chosen to illustrate the important *rôle* played by that small but well-known branch of the femoral, the anastomotica magna, in re-establishing bruit and thrill after ligature of the main artery. In three of them the branch was directly concerned, while the fourth case—the first in the series—although not involving the anastomotica directly, is used here to assist in the explanation of recurrent bruit, and also to indicate the way in which it may be avoided.

The only point in the method of operation here adopted that was common to all was a careful avoidance of any interference with the venous system, and therefore of the aneurismal cavity as well. The latter is sometimes difficult to avoid, as in this early stage it is only a blood cavity without any proper wall. But rather than risk opening into an artereo-venous aneurism, I should prefer in such a case to aim merely at amelioration in the first operation, and select a safer site for the application of the ligature.

These aneurisms, it would seem, seldom or never threaten the limb from tension, as does the ordinary aneurism, and so do not call for the, in their case, extremely dangerous proceeding of laying them open for the purpose of turning out clot.

The latter remarks apply more particluarly to large spreading aneurisms, such as the first case here given. The other three cases, although in this stage accompanied by slight hæmatomata, were more of the nature of aneurismal varices, and so would not warrant any operation that was accompanied by risk to the limb. Indeed it is held by some that a pure aneurismal varix, even when involving vessels of magnitude, does not call for operation at all; others advise postponement of the operation until a collateral circulation is well established. I do not think

that either of these objections can have been seriously meant to apply to the method of procedure used here. Certainly without operation such cases are not likely to improve, and in addition to the danger of their extending, and the venous stasis they cause, this reptilian-like circulation seems to upset the normal action of the heart. Under these circumstances, and, while believing that in the healthy young soldier a ligature may be placed without risk on almost any of the large arteries, so long as the vein also is not interfered with, I am of opinion that such cases ought to be operated on where possible. Also that in the cases which lend themselves to proximal ligature only, a radical cure is more likely to be effected at the first operation, if it is done early, than if postponed till the collateral circulation is established. A few observations will now be made on the cases taken individually.

CASE 1.—Pte. N., wounded February 5, 1900, admitted Mooi River three days later. Entrance wound (Mauser bullet) in front of the thigh, four inches below Poupart's ligament and just inside femoral vessels; exit on back of the thigh, diametrically opposite, but two and a half inches higher. No sign of fracture, though the bone must have been perforated. There was a large pulsating tumour to the inner side of the large vessels in Scarpa's triangle and extending over the inner aspect of the thigh, with some general swelling of the limb. A loud varix bruit could be heard particularly over the cicatrix, and along the vein as far as Poupart's ligament. Mr. Stanley Copley noticed that the bruit could be also heard in the post tibial, so this decided us that the superficial femoral was involved, and we hoped that the case would be comparatively simple, involving only the superficial artery and vein.

On the thirty-fourth day—the tumour having increased till the post tibial pulse was lost—a six-inch incision was made along the outer edge of the superficial femoral artery, to avoid the aneurism, and an aneurism needle was placed under the vessel about three-quarters of an inch below the origin of the profunda. All pulsation in the tumour ceased on compressing the vessel against the needle, so a broad silk ligature was drawn through and tied. The artery was again exposed below the cicatrix and tied in the same way—thus leaving three and a half inches of artery between the ligatures, in communication with the vein and hæmatoma.

Owing to tension from the latter the wound opened when the sutures were removed, and at the same time it was noticed that although the tumour had solidified a distinct bruit had returned, and later on a heaving pulsation as well. Firm bandage pressure was now applied, and after a week the pulsation disappeared, though a seemingly far off bruit could still be heard. The tumour became of stony hardness, and the general swelling was subsiding when, on the thirty-eighth night after operation, he said he suddenly turned in bed. Next morning another pulsating tumour appeared on the outer side of the thigh, separated from the former one altogether by the femoral vessels, although the general swellings shaded into one another.

The case was now very puzzling. Bandaging was tried for a fortnight further with no improvement, when it was decided to explore, as we came to the conclusion that either the proximal ligature had given way or that the produnda artery was involved. Accordingly an aneurism needle was first placed under the common femoral, and compression here was found to stop all pulsation and bruit. It is to be noted here that the bruit in the second tumour and the recurrent one in the first were of the "blowing bellows" character found in ordinary simple arterial aneurisms. Next the proximal ligature was exposed and found effective still. The portion of vessel between the ligatures had dwindled to the size of a goose quill, but when pricked it bled like a vein—dark venous blood—and had to be ligatured to stop the bleeding. Finally the profunda was exposed at its origin, but in deciding to close the common femoral now, instead, owing to the large amount of artery exposed, and of the insignificance of the branches between, we forgot to test the effect on the aneurism of compression of the profunda alone. A double silk ligature was applied on the common femoral. Uninterrupted recovery followed, wounds closed, tumours nearly disappeared, and there was no further return of bruit when six weeks later he was invalided to England.

Remarks.—In its complicated nature this case is typical of artereo-venous aneurism, when met with in the region of Scarpa's triangle. Both arteries and at least one vein were leaking. The two tumours certainly seemed separate, but it is evident now that the recurrent bruit in the first tumour was

not due to the usual cause, but to the profunda. It set in at the time when this artery would begin to give way under increased pressure from the collateral circulation, owing to partial wound of its wall. It was fortunate that the artereo-venous connection was situated far enough away from the point of bifurcation of the common femoral to allow of the proximal ligature being put on in the first operation, without danger of opening into the aneurism. Had this not been so it would then have been wiser to give up all idea of radical cure of the aneurism for the time, and while not using any distal ligature, to pass back to the external iliac as the seat of election for the proximal ligature, with a view to ameliorate matters at first. Then later on the more radical operation could be carried out with less risk. As already stated laying open artereo-venous aneurisms for any purpose is a procedure that seems uncalled for, and in a case of this kind the gravity of adopting it will be apparent.

A most interesting and instructive point in the case is the fact that, contrary to what would be expected, the piece of arterial tube left between the ligatures in the first operation was not closed by clot. On the contrary, here it remained after fifty-two days, acting the part of a venous sinus, with the opening between it and the vein still evidently patent. This discovery throws a clear light on the cause of recurrent bruit after operation; for one can now readily understand what would have happened in this case had a small branch of artery been left attached to the piece between the ligatures. Swollen by the collateral circulation, and with its stream sucked through the artereo-venous opening by the vein, such a branch would soon discharge sufficient blood through this opening to re-establish the bruit and thrill—just what happened in Case 2.

The common femoral artery is a notoriously risky site for the application of a ligature, but in the present instance the risk was minimised by the partial re-establishment previously of the collateral circulation.

Case 2.—Corpl. P., wounded February 27, 1900, admitted Mooi River eight days later. Entrance wound (Mauser bullet) over lower third of Hunter's canal; exit diametrically opposite behind, but two and a half inches higher on thigh; both mere scars. Loud varix bruit over a small pulsating swelling in

lower half of Hunter's canal. This bruit extended high up along femoral vein. A month later, as the tumour had increased in size by extending back into the ham, a radical cure was attempted. An incision six inches long was made in the direction of Hunter's canal, with the entrance scar for centre, and an aneurism needle was passed under the artery, above the tumour. All pulsation ceased on compressing the artery against the needle, so a silk ligature was drawn through. The artery was again exposed below the tumour, but as close to the latter as possible, without danger of opening the aneurism, and a second ligature was passed. Both ligatures on the artery were now tied. The anastomotica magna was not seen in the wound, so it was hoped that the distal ligature was placed above it. Wound healed by first intention, but on the tenth day, when removing the stitches, stethoscopic examination revealed slight bruit. There was, however, no pulsation, and tumour had decreased in size. Later, under massage the tumour disappeared, but bruit became more perceptible, and was now accompanied by slight thrill just in the vicinity of the entrance cicatrix. When invalided two and a half months after operation bruit and thrill remained the same, but would not be noticed unless looked for.

Remarks.—The anastomotica magna was evidently higher up than was expected, and so was left between the ligatures, thus causing recurrent bruit in the way suggested under the previous case. As the patient was so long in hospital he had to make room for a fresh case, or the further slight operation of tying the anastomotica would have been done. He was, however, practically cured. After seeing the completely successful result in Case 4 it would appear that failing to exclude any small branch from between the ligatures, on account of the proximity of the aneurism, the next best thing to do is to cut and ligature it.

Case 3.—Pte. A., Mauser bullet wound just above knee-joint with entrance and exit so placed as to indicate damage to main vessels. There was a painful swelling in the popliteal space, with a strong thrill in it, and varix bruit of the characteristic kind, which extended up along the femoral vein. The swelling was confined behind the adductor tendon—thus leaving Hunter's canal free. On May 1, 1900, the late Sir William

Stokes tied the superficial femoral artery at the apex of Scarpa's triangle. Wound healed by first intention and swelling and pain subsided, but when the dressings were changed a slight bruit could be heard with the stethoscope, and a few days later this was accompanied by slight thrill in the vein. The thrill was hardly noticeable, and the patient made a good recovery. Invalided the forty-fifth day.

CASE 4.—Sergt. P., wounded February 23, 1900, admitted Mooi River seventeen days later. Entrance and exit on inner and outer aspects of thigh. These wounds were close to the knee-joint and so placed that damage to popliteal vessels was indicated. There was well-marked aneurismal swelling with pulsation, bruit and marked thrill at upper part of ham; signs of venous obstruction, with sensation of "pins and needles" in foot. Patient was allowed up for two days, when it was noted that the tumour distinctly increased, and the tingling sensation became more marked. The thirtieth day after admission the femoral artery was ligatured by Mr. Sidney Hulke, at the extreme lower end of Hunter's canal. A small branch of artery, thought to be one division of the anastomotica, was wounded, and ligatured at the same time. Circulation in limb was well re-established by next morning, and there was practically no pain whatever. Wound healed by first intention, and there was never any return of pulsation, bruit, or thrill. At the end of three weeks posterior tibial could just be felt, but there was still some pain in sole of foot. Patient was allowed up, and invalided apparently quite cured thirty-four days after operation.

Remarks.—This completely successful case of Mr. Hulke's probably owed the non-recurrence of bruit to entire and not partial division of the anastomotica magna—the only vessel between the ligature and the artereo-venous opening. It shows what a perfect result may be obtained from a proximal ligature well placed, and naturally raises a doubt as to the necessity of the distal ligature at all. Certainly in situations like the popliteal space, where the numerous articular branches cannot be obliterated between the ligatures, if a distal one were put on as well, the operation performed here seems the best possible. It is as well to remember, however, that these operations were all performed on comparatively recent aneurisms, and on

"lying down" cases, so that while ligatures placed immediately above the aneurism might generally have been found sufficient for such cases, they might prove unsatisfactory for those of longer standing. On the whole it would seem sounder to apply ligatures above and below the aneurismal communication, where it can be managed, so that no branches are left between, and to reserve proximal (Anel's) ligature alone, for the rest of the cases.

PREVENTIVE MEASURES AGAINST MALARIA IN KANDIA, CRETE.

By Major J. V. SALVAGE.
Royal Army Medical Corps.

A.—I have the honour in reply to your Minute of August 8, 1902, to report as follows upon the further steps taken with reference to the occurrence of malarial fever in Kandia.

Breeding places of large numbers of Anopheles have now been located—outside, but near to the camp; these may be grouped in two distinct classes.

(1) The slowly flowing streams in the open country to the west and south-west of the camp. The most important of these is no doubt the nearest one (known as "the first river"), which through the last part of its course runs roughly parallel with the line of the camp at about half a mile in distance.

(2) Certain of the wells and a few of the tanks connected with the houses in the town: the most important of these are, again, those lying roughly in a line parallel with the camp and distant from 100 to 200 yards.

The "Camp" consists of huts on a part of the ramparts extending over nearly a mile in length and running from the sea at the north-west in a gentle curve to the undermentioned bastion on the south. The accompanying rough sketch map will give a clearer idea of the situation.

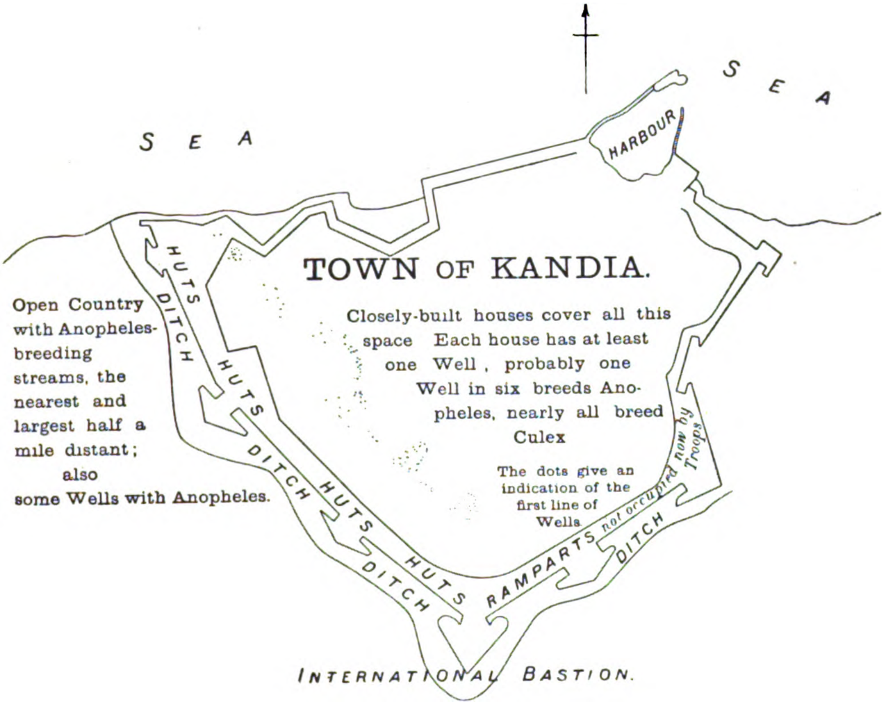
It is unknown whether the mosquitoes in the camp are bred in both, or in one rather than the other, of the above groups. A comparison of a large number of mosquitoes captured in the camp with numbers of those bred from the several breeding grounds might throw light on this subject, which is not without importance. I find, however, a difficulty in breeding out Anopheles larvæ removed from their natural habitat, and want of time prevents my pursuing this investigation.

Measures taken to destroy the larvæ:—

(1) As to the stream. The Officer commanding troops employed some of the men to dig out the mouth of the river on the sea-shore, where it had become silted up with sand; this lowered the water in the stream about two feet, and as the banks in many places were very broad, with a very gradual slope, the effect

was to destroy some acres of breeding ground. There still remains, however, a sluggish stream with a width of from fifteen to twenty feet; along the margins of this amongst the reeds a considerable amount of petroleum has been put.

(2) As regards the wells. These can only be dealt with by house-to-house visitation. They are situated in the small courtyard or garden which each house possesses. Their total number is immense, as there is an average of about one to each



house. The houses are grouped together in irregular masses; here and there blind alleys run into the centre of a group, with houses on either side. The outside walls are all high. Neither the alleys nor the streets are named, nor are houses numbered, so that it is very difficult to identify a particular house, or even to know when every house in a cluster has been visited.

The process of examining their wells is tedious. After knocking and parleying, the inmates decide to open the outer

door; one has then to wait for all the women to go into the house and close the doors and shutters to prevent the possibility of being seen, and the door is eventually opened, generally by a small child. Enquiries are useless, and search has to be made for the water.

Anopheles larvæ have been found in probably about 10 to 15 per cent. of the wells examined.

One of the following three methods are followed when larvæ are found: (i.) The well is altogether closed, or (ii.) petroleum is thrown down, or (iii.) fish put into the well.

The first method is only resorted to in the case of unoccupied premises, or at the request of the occupier, when there are two or more wells in a small space, and one only required for use. The third method as yet is only in an experimental stage; it is uncertain whether many fish will live, as most of the wells are deep, narrow and dark.

It is clear that with existing arrangements we shall not be able to deal with even a large portion of the town, which is thickly populated, and I have, as a matter of fact, restricted my efforts to the one set of streets and adjoining blocks of houses which lie close to the line of the camp.

The civil authorities, medical and municipal, have been approached, and profess agreement with our views and promise action, but not very much is to be expected for some time.

The present Officer commanding troops has been fully in sympathy with this work, and has taken personal interest in it, and in some cases, as in the digging out the mouth of the river, has initiated the steps taken. The Governor of Kandia, at any rate openly, supports the view taken by the Officer commanding troops, and if it should happen that any particular Officer commanding did not sympathise with this work, it would be even more difficult than it now is. I think it likely that vigorous action taken by an efficient municipality in a fair financial position would soon entirely free Kandia and its neighbourhood from malaria.

Results.—There is no doubt that millions of mosquito larvæ have been destroyed, but it is yet too soon to know if this has been directly beneficial to the troops. It is, however, hopeful that whilst at this time last year the admissions into hospital were increasing they are now either diminishing or remaining stationary. To produce marked and lasting beneficial effects, continued and systematic efforts will be needed.

As to other preventive measures adopted, I would note that on arrival here all the men of the Cameron Highlanders were provided with mosquito nets.

B.—As to the question of a summer camp. The difficulty of finding, in an accessible place, a really good site, offering fair probabilities of being quite healthy, has not yet been overcome. Since the termination of the Board last year I have made another brief visit to the Ida range of mountains, and have discovered another plain some 1,200 or 1,500 feet higher than Nida Plain, smaller, but, as it seems to me, possessing advantages over Nida Plain. I was only able to explore one of the ways of approach, and I do not therefore know whether it is more or less accessible than Nida. Therefore Mount Jukta in my opinion continues to offer the most practicable site, although it is not an ideal place by any means. But whatever may be done in the way of a camp, I am confirmed in my opinion that it is useless in any particular year to move into camp late in the summer. If a move is to be carried out at all, preparations should be made during the winter or early spring. Two or three huts should be erected and arrangements made for water, &c., and the troops should be moved not later than May or very early in June, before large numbers have become infected.

For the present year I think it would be advisable to postpone decision for three or four months, when it may be expected that some opinion may be expressed upon the utility of the measures taken for the destruction of mosquitoes.

THE TRANSPORT OF INVALIDS.

By Lieut.-Col. FORMAN.
Royal Army Medical Corps.

In the first number of the Journal the Director-General says: "It must be clearly understood that its pages will not be open to controversial correspondence." I quite grasp his meaning, but just as the Government of the country is conducted on party lines of criticism, so must any journal allow the negative to be stated in answer to, or elaboration of, any opinion that may be expressed in any article that may be published in its pages. It is so, it is necessarily so, in all journals, and I think particularly in medical journals; for the aphorism "doctors differ" is not without a permanent substratum of truth.

I am led to make these few preliminary remarks *à propos* of Capt. G. B. Stanistreet's interesting article on "Hospital Arrangements on Board Transports," for it is a subject in which I have been keenly interested since 1886, and it is a subject to which far too little attention has been paid by Army Medical Officers. I have not a word to say in criticism of Captain Stanistreet; on the contrary, he has given me several new ideas, but I wish to elaborate his article, and in so doing may trench on the controversial, but I hope within the limits of the taboo.

I say, it is a subject to which far too little attention has been paid by Army Medical Officers, but I would add, not unnaturally; for a man once or twice in the course of twenty years' service may find himself for a week or two in charge of a transport with Indian invalids on board; he does the best he can with the means at his disposal, hands over his invalids at Netley, and straightway relegates an unpleasant experience into the limbo of oblivion. I take as my text, then, this assertion, that there is not only a crying need for improvement in our methods of transporting our invalids home, but it is a duty incumbent on all my brother officers to do everything in their power to point out how faulty existing arrangements are, and to try and initiate reforms. Some eight or nine years ago I wrote an article in the *United Service Magazine* on this subject, and I am not without hopes that it did in some small degree help on reform, for of a certainty matters are much better now than they were then.

Perhaps it will make my subsequent remarks clearer if I relate two experiences of mine which led me to do all in my power to ameliorate the hardships of those unfortunates who had lost their health through the strain of tropical service.

In 1886 I was ordered to take over charge of a batch of invalids (about 200) encamped on the maidan at Meean Meer. These were the invalids from Peshawar, Pindi, Mooltan and other stations further up country. We started for Deolali in a troop-train and *en route* I took up the invalids from Amritsar, Umballa, Allahabad, &c., in short, everywhere, till I had 480 of them, men, women and children. Of these 280 were cot invalids, many of them very seriously ill, yet we had nothing but an ordinary train, one young apothecary to help me, a field medical companion, and the diet of rest camps. We halted half a dozen times *en route*, our train was changed three times owing to our passing over different systems, and we took a week or more to reach Deolali. Arrived there we had to halt two or three weeks whilst necessary (?) formalities were gone through. Of course the hospital could not accommodate a quarter of the sick, and their dieting, housing, &c., was largely a matter of chance. Then we were ordered to go on to Bombay to join the "Serapis"; we travelled all night in an ordinary troop-train, reached Bombay about 6 a.m., and the unfortunate invalids were kept on the Sassoon Bunder till about 11 a.m., and then towed off in cargo flats. It was late in March and very hot. We got alongside only to find the ship packed with time-expired men, gangways crowded with natives, no means of lifting helpless men on board, a non-dieted hospital of some thirty beds and one Sergeant, one Corporal, three Orderlies and one cook, R.A.M.C. (then A.H.C.), to attend to the whole 480. On the voyage most of the sick were accommodated in naval cots in the 'tween decks, sharing the accommodation with healthy time-expired men. On two occasions—at Port Said and Malta—they were smothered in coal dust, which, I take it, is not particularly conducive to the welfare of phthisical patients, of which there were a dozen or more. Arrived at Portsmouth, there was certainly a train to carry them on to Netley, but nothing else, and we actually carried the helpless men on our backs from ship to train. It was only when we arrived at Netley Station that we found

things as they should be, and there the arrangements were perfect. I was very ill myself with chronic dysentery, and it was untold relief to me to find on arrival there that I was freed from responsibility. As a matter of fact, I was ordered off to the Mess to sit down and rest, and within an hour a brother officer came and told me that all the sick were attended to and were in bed. More than two months had elapsed from the time we left Meean Meer, eight men never saw the end of the journey, and I do not exaggerate when I say that more than one-half of the invalids were worse than when they started.

My second experience was some eight years later, I think in 1894. I was quartered in Rangoon and ordered to proceed thence to Belgaum per R.I.M.S. "Dalhousie," *viâ* Bombay, to take medical charge and convey twenty Burmah invalids, *en route* to England, to Colaba. The ship (small at the best) was packed with troops; the voyage took ten days; it was March and very hot. Among the invalids was one poor wretch rotting away with malignant syphilis, a repulsive mass of corruption; the others were all bad cases. The hospital accommodation was one gloomy cabin in the alley way, with two small round ports and its door opening immediately on to the engine room, whence the hot air ascended. (The "Dalhousie" is still in use as a transport—I saw her a few weeks ago in Aden.) The syphilis case I put perforce in the apology for a hospital, but the other men objected to be housed in juxtaposition to him—naturally so. But there was not a square yard of accommodation anywhere, so there was nothing else for it but to get the men to make room on the decks for the others, and there they lay exposed to dew and vicissitudes of weather for the ten days. The Assistant Surgeon (Apothecary then) reported to me one day that one of the men had been brought down very ill. I went and saw him; he had a temperature of 106° and was semi-conscious. He was kept in the *hospital* and active treatment employed. He rallied towards the evening, and the first thing he said was, "For God's sake take me out of this!" meaning that he could not stand the stench arising from the poor syphilitic patient in the close den he was in. I could not but accede to his request and took him up on deck, where he spent the night packed in with other men, exposed to a heavy dew and with a temperature of 104°.

These two cases are in no way exaggerated, neither are they examples of mediæval barbarism; they happened a few years ago and they are happening now. At the risk of being ruled out of order I ask, is this right? Is it even humane? I need not wait for an answer.

I observe that Capt. Stanistreet in his article differentiates between hospitals on transports and hospital ships, but we must not forget that there is no strict line of demarcation between these two apparently different things when we are dealing with the peculiar circumstances which are a normal adjunct of British military service. Our transports are of necessity frequently hospital ships, or rather ought to be. I am therefore very glad to see that the "Plassy" has been fitted with 100 beds and provided with a staff of nursing sisters, orderlies, &c. But I cannot ascertain whether her hospital is "dieted" or "non-dieted." though I do know that she will carry a large number of healthy men in addition to the sick. This is certainly a move in the right direction, and should encourage us all to persevere in our efforts to still further improve the sick transport arrangements.

I often hesitate whether I should or should not invalid a man, not because I am in doubt as to the advisability of sending him home, but because I fear that the journey may be too much for him. We want to look at the matter from the standpoint of the unfortunate sufferer himself. Given, say, a case of chronic dysentery of the type which requires months of careful dieting and skilled treatment, the doctors and nurses have coaxed him along, trying to heal the ulceration and restore the bowel to normal action; slowly but surely the man is gaining ground, but clearly he must leave the Tropics, and in due course he has to face the ordeal of the rest camp, with its rations, and the fœtid atmosphere of the packed transport in the Red Sea. In a few days the work of months is undone, and the wretched man arrives at Netley, if perchance he arrives there at all, far worse than when he started. From the utilitarian, apart from the humanitarian, aspect this is indefensible. Netley has to begin the work *de novo*, and many a man who under a rational system might have been restored to the ranks, is invalided out of the service, or loses his life altogether. Or, again, looking at the matter from another point of view, is

it right that cases of tuberculosis, many of them far advanced, should be sent in a ship packed with men? I suppose we all subscribe to the "open-air treatment," and all of us know what the "open air" on one of these ships is like. Moreover, we are subjecting the healthy men to a serious and unjustifiable risk.

I do not wish to weary my brother officers by multiplying instances of the grave defects of our present system, most of them can fill in the gaps much better than I can state them; but I may be allowed to suggest the palpable remedy, the which, I make bold to assert, will receive their unanimous approval and in so doing stimulate them to work towards that end.

Briefly, the remedy is a floating hospital as an integral part of the Army medical equipment and invalid trains in India fitted to meet the requirements of modern medical science. I see no reason why (outside the necessary moving) a patient should not be benefited by the change from the moment he starts, and I am certain that instead of a grave risk the sea voyage should be a highly efficacious therapeutic agent.

I am quite aware that I shall be met with a financial *non possumus*, but I doubt if the expense would be very great, nor do I think that it should be considered. A hospital ship, say, starting from China, thence to Rangoon, Calcutta, Madras, Colombo, Cannanore, Calicut, Bombay and Karachi, fed at most of these points by hospital trains; thence to Aden, Egypt, Malta, Gibraltar and home. Given that she was a hospital ship in the true acceptation of the term—in short, a thoroughly equipped floating hospital—would not the patients derive the greatest benefit from their sojourn on board of her? She might do two or more voyages in the year to the East, her spare time being possibly utilised in Colonial invaliding, for conveyance of women and children, or perhaps in taking weakly men for short sea voyages, as is sometimes done now by the R.I.M. ships. Nor do I see why on the outward voyage she might not be used as a transport.

I have only roughly sketched my idea, but if I can but succeed in interesting my brother officers to press forward so desirable a reform to ultimate fruition, the soldier will, whether he knows it or not, have reason to bless the R.A.M.C. for yet one more benefit—not the first, and, I am confident, not the last.

THE SUPPLY OF ELECTRICITY FOR X-RAY WORK IN THE FIELD.

By Lieut. and Quarter-Master F. BRUCE.
Royal Army Medical Corps.

If electricity could be obtained in the same manner as medicines and surgical materials a far-reaching problem would be solved. Up to the present the consummation of such a desirable means of meeting the important needs of the X-ray worker during active operations in the field has not been attained. It therefore becomes a very serious question how far the difficulties common to a supply of electricity can be best overcome. Unfortunately, during a campaign these difficulties become intensified through local considerations and the exigencies of war. Where accumulators are used means are not always available for keeping in touch with an electrical generating station to keep them charged. Such a station may be within easy distance, perhaps a long way off, and it may happen—for instance, in an uncivilised country—that no means whatever are available for charging the cells. These latter exigencies are the most serious of all, and unless provided against by the provision of a portable charging plant as part of the X-ray apparatus the surgeon is totally deprived of a valuable aid when making his diagnosis.

Regarding the various methods for obtaining the necessary supply of electrical energy it has, I think, been clearly demonstrated in practice that primary batteries, thermopiles and static machines are unsuitable. Although many attempts have been made to render static machines portable, and no doubt some success has been attained, yet from their construction they are very delicate and cumbersome and very sensitive to climatic conditions. For photographic work they are not equal to the induction coil. The use of accumulator cells is limited to situations where they can be kept charged, and it is mainly the object of this paper to suggest means by which charging can be effected under most conditions. In a paper of mine read before the Röntgen Society, and reproduced in this Journal, I maintained that for field use no X-ray apparatus can be considered complete which does not possess its own means for generating electricity, and my opinion is now shared by

other experts. I have endeavoured by actual experiments to devise a generating apparatus suitable to the needs of an X-ray installation. In this the first consideration is a motor, of which three kinds are well known, namely, oil, petrol or steam engines. Unfortunately, oil engines of a small size are not very efficient. They require a certain amount of skill in manipulation, and are very heavy and bulky for the power they give out. In a petrol-driven engine we have a motor as near perfection as it is possible to get, having weight, power and general efficiency in view, provided a supply of petrol is available. This matter of a petrol supply will prove a stumbling block to its adaption for use under every condition of service. In a steam engine we have a machine which under recent improvements can be worked anywhere. These improvements have been brought about in the race for supremacy in actuating the machinery of the motor car, and consist of a new system in valve construction, increased power for size, and the introduction of a steam generator having none of the disadvantages of an ordinary boiler. The engine in itself is most compact and easily managed, and being of high speed can be adapted to drive the armature shaft direct without the need of using belts and pulleys. The steam generator, which is commonly styled a flash boiler, is simply a helical of steel tubing suitably heated when the engine is running. Only sufficient water is injected into the coils to produce steam for each stroke of the piston, the water on entrance being immediately vaporised. Hence there is no boiler to burst through mismanagement, water or steam gauges to be attended to, only the heating of the coils to be seen to. The fuel may be either coal, wood or paraffin, the latter requiring a special burner. An engine of this description, with steam generator and dynamo, could, so I am informed by a reliable firm, be obtained, packed ready for shipment, weighing approximately 3 cwt. The dynamo need not be large, several patterns now in the market being very compact and efficient. One giving 300 watts would not only be suitable for charging batteries, driving coil direct, but in addition, if necessary, lighting up an operation room. The detail of the plant would consist of: Engine, three-quarter horse power. Steam generator provided with pump, and means for using either coal, wood or paraffin. Switch-board having voltmeter, ammeter, fuses and

switches. Dynamo, Manchester type, compound wound. Supply of wires, sixteen candle-power lamps with holders. With this plant the induction coil could be driven direct from the dynamo.

Such a contrivance would, in suitable hands, prove a great boon to the X-ray specialist, not to mention the surgeon who ultimately benefits by the results obtained.

There is another method of providing electrical current, which, provided a dynamo is available, could be obtained by annexing it with the shafting in a mill. But how often are mills to be found working during a campaign? Certainly in Ladysmith this was instanced, yet we dare not depend on always finding such a convenient means of driving our dynamo. It was quite an accident that a dynamo there was available for use, as it forms no part of an X-ray apparatus. When an X-ray installation is complete in itself, with means for charging batteries, then and only then will its utmost efficiency under any circumstances be available for the needs of the surgeon who has every right in warfare to command its assistance.

CEYLON AS A FOREIGN STATION.

By Col. R. H. QUILL.
Royal Army Medical Corps.

In the November issue of our Journal there is a paper by Major Freeman, R.A.M.C., on "Bermuda as a Garrison," the object of his communication being to give information which would prove useful as well as interesting to Officers proceeding on duty to the Colony of Bermuda. May I say that I look upon Major Freeman's purpose as a most useful one, and hope his example will be followed by other officers in our Corps giving descriptions of the foreign stations they may have served in. The practical information embodied in such accounts cannot fail in being of value and interest to those who may in the future be called upon to serve in the stations described.

As a contribution to the design initiated by Major Freeman, I propose in this communication to give a description of Ceylon, in the hope that it will be useful to those officers who in the future may have the good fortune to serve in that beautiful island, one which, in natural scenery, can vie with any part of the world.

Garrison.

The normal garrison of Ceylon comprises one European Infantry Battalion, three Companies of Royal Garrison Artillery, half a (Fortress) Company of Royal Engineers, together with detachments of Royal Engineers, Army Service Corps, Royal Army Medical Corps, Army Pay Corps and Garrison Staff. In addition there are some Asiatic troops, composed of two companies of the Ceylon Mauritius Battalion, R.A. (average strength 135), and a Submarine Mining Company Royal Engineers (average strength 49).

The distribution of the troops is as follows:—

Colombo.—G.O.C. and his staff, with all heads of departments. Headquarters of British Infantry Battalion and three Companies. One Company Royal Garrison Artillery. One Company Ceylon Mauritius Battalion, R.A.

Kandy.—Two Companies British Infantry Battalion. Two Companies Royal Garrison Artillery.

Trincomalee.—Submarine Company Royal Engineers. Half Company (Fortress) Royal Engineers. One Company Ceylon Mauritius Battalion, R.A.

Newera Eliya (*Sanatorium*).—Forty convalescents.

Station Hospitals.

There are station hospitals at Colombo, Kandy, Trincomalee, with a small non-dieted hospital at Newera Eliya.

The distribution of Medical Officers is as follows :—

Colombo.—Three Medical Officers, including the Senior Medical Officer.

Kandy.—One Medical Officer.

Trincomalee.—Two Medical Officers.

Newera Eliya.—One Medical Officer.

Colombo.

Colombo, the capital of the island, is now an important centre of trade owing to the completion, in 1882, of an extensive breakwater which has converted an open roadstead into a fine harbour, one that provides safe anchorage for ships of any size, irrespective of weather conditions. This substitution of an extensive harbour for an open roadstead has concentrated the commerce of the island at Colombo, making that town one of the most thriving in the East. As all steamers bound for India, Australia, Burma, China and Japan call at Colombo, "trippers" are numerous. To accommodate such gentry and other travellers, some very fine hotels have sprung up. The Grand Oriental, Bristol, and Galle Face Hotels, especially the latter, are all palatial buildings, not indeed to be equalled, as hotels, in the East. Each and all are comfortable, and all things considered, to residents, moderate in their charges; conditions which induce many married officers to reside in them in preference to undertaking the responsibilities of private housekeeping; the more so, as quarters for married officers are limited in number, and suitable private bungalows are difficult to secure, and are of high rental.

The station hospital, a fine building of modern construction, occupies a commanding site facing the sea; attached to it is an excellent and commodious bungalow for the Medical Officer in charge. A smaller bungalow, fairly commodious, situated in Flag Staff Street, is reserved for the Junior Medical Officer.

The headquarter offices, giving office accommodation to the G.O.C. and all heads of departments, is a fine block situated in its own compound. This concentration of staff offices is very convenient and greatly lessens official work.

Climate.—The climate of Ceylon differs, of course, exceedingly at different elevations, but even in Colombo, the hottest of the military stations, the temperature, compared with that on the mainland of India, is equable and limited. The average yearly temperature in Colombo is 80° F., April being the hottest month, and December and January the coolest, but the variation of temperature throughout the year is small.

About May 20 the south-west monsoon sets in, with a deluge of rain, strong wind, much thunder and lightning, and continues to be the prevailing wind until October, when the north-east monsoon sets in. The average rainfall is 80 inches.

The heat of Colombo is unmistakably muggy, especially so, in my experience, during the rainy season, *i.e.*, June, July and August. During those months the climate of Colombo is not unlike the temperature of an immense hothouse tempered by soft sea breezes. In such a climate the skin acts on small provocation, and only the lightest clothing can be endured. For uniform white drill or khaki is worn; when mufti is donned tropical tweeds or flannel suits are the most suitable materials. All residents in Colombo should have a good supply of under-garments, for a change of underlinen has to be made twice or oftener in the day by all who take active exercise. In connection with this matter of under-garments I wish to say a special word in favour of the constant use of Jaeger's elastic abdominal belts, articles of underwear which I consider to be a great safeguard against liver and intestinal disturbance.

The excessive action of the skin in such a climate as that of Colombo predisposes to chill, the occurrence of which is followed by liver congestion and intestinal catarrh. To prevent this chill we must have some material, in close contact with the abdomen, which will readily and effectually absorb the perspiration which abundantly collects there. For that purpose I can confidently recommend the belts I have named; they should be changed once or twice a day, a fresh one being invariably put on when retiring for the night, and a light cummerbund as well. I make no apology for entering into

the foregoing details of under-garment wear, experience having taught me the value of the advice I offer.

This sketch of the climate of Colombo may read dispiriting, but although most people do not find the climate a pleasant one, it has the important advantage of being, in my experience, healthy, if ordinary care is exercised.

Amusements.—The amusements available at Colombo are numerous. Within a mile or little more of the Fort is one of the finest racecourses in the East; there throughout the year numerous race meetings and gymkhanas are held.

The principal racing fixture comes off in August; at that meeting valuable cups and stakes attract to Colombo the best horses in India of the Waler class.

Adjoining the racecourse is an excellent polo ground, on which play takes place twice or thrice a week. Nearer the Fort is Victoria Park, an extensive and attractive asset of Colombo. The Park contains an excellent cricket ground, picturesque gardens, where tennis and croquet flourishes, delightful rides and drives, as well as a ladies' golf course. Those who like social functions such as dances, dinner parties, picnics, &c., can have their taste fully gratified, especially during the Colombo season, *i.e.*, in the south-west monsoon months, June, July, August and September. At that period of the year there is a plethora of society gatherings. For men there is a first-rate club in a delightful position on the sea front; there hospitality is unbounded, and bridge and billiards are always going after 5 p.m.

Last, but not least, some three miles from Colombo there is an excellent golf course of eighteen holes, named "The Ridgeway Links," after Sir West Ridgeway, who was Governor of Ceylon when the links were opened. The links, some three miles in length, are sporting in character, and have excellent greens. They are largely patronised by enthusiastic golfers, a numerous body in Colombo.

Kandy.

We will now leave Colombo and travel up country by rail to Kandy and Newera Eliya, the latter being the delightful sanatorium of the island. Kandy is 72 miles from Colombo and 1,676 feet above sea-level; the temperature in the day-

time is some 3° lower than that of the coast stations and less humid. Nevertheless, the heat is often oppressive, Kandy lying in a deep hollow, as in the bottom of a cup. The main difference in climate is experienced at night time, a blanket or two being always required, whereas in Colombo a sheet is ample night covering. The rail journey between Columbo and Kandy is strikingly beautiful; it must be seen to be fully appreciated, no description doing it justice. I will only say that the panorama of bewitching scenery as the train climbs up the steep gradients, winds round hills clothed with luxuriant tropical vegetation, and passes through wonderful valleys, is a revelation to the traveller.

The "hill capital of Ceylon" as Kandy is called, is most picturesque, in its way, indeed, quite unique. A beautiful little lake nestles at the foot of mountains covered with gorgeous vegetation, and by the borders of that lake lies Kandy, picturesquely built, and surrounded by lavish and irrepressible greenery. Kandy is a great centre of Buddhism, and contains the renowned "Temple of the Tooth," where a reputed tooth of Buddha is jealously preserved in an elegant shrine. The famous tooth is not "above suspicion," for it is well-known that the original relic was destroyed by the Portuguese, and the present substitute, to non-Buddhist eyes, appears to be nothing more than a piece of discoloured ivory, bearing indeed, no resemblance of any kind to a human tooth. Kandy has none of the bustle of commercial Colombo, but is a sociable and popular little station.

Newera Eliya.

Leaving Kandy by train for Newera Eliya, we enter almost at once on the tea country. For miles and miles the hills are seen to be covered with the tea bush, and the scenery as the train climbs upwards, is hardly, if at all, inferior to that experienced between Colombo and Kandy. At Nanuoya the train is left, the remainder of the journey to the sanatorium being completed in a species of waggonette, or coach, as it is called. By this time the wise traveller will be wrapped in an ulster with a heavy rug over his knees, the temperature having fallen 20° or more since he left hot and humid Colombo. Between Nanuoya and Newera Eliya only some four miles

intervenes, yet Newera Eliya is 2,000 feet higher than Nanuoya, a fact which will indicate the steepness of the ascent.

The extensive table-land named Newera Eliya is 6,210 feet above sea-level, and has been used as a health resort since, I believe, 1828. The climate is European, and at times (January and February) almost wintry, the temperature at night-time sometimes falling to 26° or 27° F., the ground covered with white frost, and pools of water being frozen over—a marvellous difference between the climatic conditions of Colombo, only eight hours distant by rail. In the daytime the temperature rapidly rises, but in the shade is never more than 70°, the average being 60°. The keen mountain air is wonderfully bracing, and being so easily and quickly reached is of the greatest advantage to those who have become run down by the high and humid temperature which is constant in Colombo.

On children the climate of Newera Eliya has a most beneficial effect. There they quickly regain the colour and energy lost at Colombo or Trincomalee. I would counsel parents to arrange, if possible, for the residence of their children at Newera Eliya all the year round. I adopted that plan for my two boys, aged 5 and 6 years, with the result that on their return home, after two years' residence in the East, they had all the appearance of children reared in the highlands of Scotland. If continuous residence at Newera Eliya for children is not possible, then I would suggest for them a yearly change there; the visit commencing about September 15 and continuing until the end of January. During that period bungalows can be had for half the price asked for them between February and May, *i.e.*, the season time. Of course, if residence can be extended to May so much the better for the child, the months of March, April and May at Colombo being always unpleasant and trying ones.

It is, in my judgment, difficult to praise Newera Eliya too highly. It is one of the most beautiful hill stations in the East, with shady walks, rich foliage, a picturesque lake and other landscape attractions most pleasing to the eye. The facilities for recreation are numerous: cricket, football, hockey, tennis, croquet, boating, trout fishing and golf are all in full swing between January and May. The golf links are allowed to be the finest in the East; I have had many pleasant rounds

on them and can testify that they are a source of great attraction to visitors from India, Singapore and Burma. In addition there is an excellent little racecourse where many pleasant meetings are held.

During the months of June, July and August (the south-west monsoon months) there is a good deal of rain and wind, so much so that during those months the sanatorium is largely deserted. Yet old residents at Newera Eliya have assured me that there is no portion of the year there so healthy as the monsoon months, unpleasantly wet though they be; an opinion which has been borne out in conversations I have had with the local medical practitioners. For the remainder of the year the climate is delightful.

The Military Convalescent Depôt is opened by September 15 and remains available for the reception of convalescents until the end of May. During that period successive batches of men quartered in Colombo and Trincomalee who have been run down by the continuous muggy heat of those stations, or those who are convalescing from attacks of acute disease, are brought to Newera Eliya for a complete change of climate. The improvement which invariably follows is very great. The Medical Officer in charge of the Convalescent Depôt is usually relieved after a three months' tenure of his appointment, so as to allow another medical officer to have the benefit of the Newera Eliya climate.

The excellent and hospitable "Hill Club," which has a number of comfortable bed-rooms attached to it, is usually made use of by all officers doing duty at the sanatorium.

Newera Eliya, which has many pleasant memories for me, is now widely known, and year by year is an object visit for crowds of tourists from all parts of the world. It is a satisfaction being able to state that before I left Ceylon in 1902, it was finally decided to establish a sanatorium at Newera Eliya on a permanent and liberal basis, for the use of the troops quartered in the Command.

Trincomalee.

I must now say something of Trincomalee, which is situated on the north-east coast of the island. Trincomalee is a paradise for a sportsman of the shooting class, a variety and profusion of game being found in its immediate vicinity. A fair shot can

secure twenty or thirty couple of snipe in the day during the season, while a good shot can account for fifty or sixty couple as the result of his day's tramping in paddy fields or along the lagoons (tanks they are called in Ceylon), which afford admirable feeding ground for snipe and duck. One of the most famous of the Trincomalee snipe fields is to be found at Tamblegam, a place very familiar to Major G. E. Hale, R.A.M.C., one of the finest shots who ever served in Ceylon. and whose bags have, I believe, never been equalled. It was a red-letter day in the annals of the "Tamblegam snipe," when Major Hale was ordered from Trincomalee to South Africa on the outbreak of the Boer war.

If the paddy fields and tanks are left for the surrounding dense jungle, bears, leopards, buffaloes and various species of deer can be found, as well as the lordly elephant, but at the present time an expensive special licence has to be secured before elephant shooting can be indulged in.

Trincomalee, being out of the course of trade, would be but little known were it not for its possession of the finest harbour in the East. In that harbour the largest battleships can find accommodation and security, no matter how boisterous may be the weather. The harbour is not only safe and extensive, it is also wonderfully picturesque. Looking down on it from the barracks, its appearance, owing to its being landlocked, is that of a beautiful lake, studded with islands, and not the great harbour it is. The first time I looked on Trincomalee Harbour it reminded me irresistibly of the Lower Killarney lake, and I could not have believed it was anything but a beautiful lake had I not seen lying at anchor, within a stone's throw of the shore, two big war-ships.

The barracks, officers' quarters, and mess are of modern construction, and have an ideal position looking on to the picturesque harbour.

Trincomalee is most difficult of access, owing to there being no rail connection between it and Matale, which is some 100 miles distant.

To reach Trincomalee from Colombo travellers have a choice of two routes: (*a*) By sea in a small coasting steamer, which discharges and takes in cargo at various intervening ports; a tiresome and uncomfortable voyage, which consumes four or five

days. (*b*) By train to Matale, *via* Kandy, and from there by coach and bullock waggon to Trincomalee. The road journey between Matale and Trincomalee is a most trying and fatiguing one. Thirty miles are completed in a nondescript species of coach, the remaining seventy miles have to be undertaken in a bullock cart (called a bullock coach !) drawn by two bullocks, which are changed every five or six miles. The continuous vociferations of the half nude native driver, addressed to his overworked team ; the jolting of the coach along the jungly road for seventy long miles, and the *esprit de corps* from the perspiring Jehu is, I can aver, a most trying experience. I am a fairly tough specimen of manhood, yet whenever I made this road journey between Matale and Trincomalee I reached my destination a sad wreck.

Between, then, a choice of evils, I recommend the coasting steamer to the traveller proceeding from Colombo to Trincomalee, except during the south-west monsoon months ; at that period of the year, unless the traveller is an accomplished sailor, I unhesitatingly recommend the journey by road.

My residence in Trincomalee having never extended beyond four or five days at a time, I am not in a position to say much, from personal experience, regarding its climate. The temperature is practically the same as that of Colombo, but the air is much less humid, which is difficult to understand, both being coast stations. As already mentioned, to anyone devoted to shooting, service in Trincomalee would be entirely suitable, but in the absence of such an interest I should think that life there would be uncommonly dull.

I have heard ladies say that they "loved Trinco," a declaration I have ever failed to understand—no shops, very limited society, equally limited amusements, indifferent food supplies ; a trying climate, and the knowledge that to reach the nearest railway station you have to travel some 100 miles in a primitive conveyance on a jungly road, ought surely to be considered by the fair sex serious drawbacks to "loving Trinco."

To complete the foregoing sketch of Ceylon as a garrison, something must be said as to its healthiness or otherwise.

When describing Colombo, I said "although the climate of Colombo is not to most people a pleasant one, it has the great advantage of being healthy, provided ordinary precautions are

taken." That is so; certainly most of the Colombo residents, especially children, quickly lose their colour, owing to the excessive skin action, but their bleached appearance is no indication of bad health. A similar observation is applicable to Trincomalee and Kandy. Among the troops there is little malarial fever, thanks to the rarity, in the military stations, of the malaria-bearing mosquito. The Culex variety is everywhere met with, but the Anopheles genus, most fortunately, is practically an absentee. Dysentery, when it occurs, is seldom severe, and is easily dealt with. Cholera, among Europeans, is very rare, and cases of enteric fever are quite infrequent.

A word as to finance. The pay for all ranks is slightly less than the Indian rate, but the expenses in Ceylon are less. Servants on the whole are good, and all speak English. I have had two tours of service in Ceylon, the first commencing in December, 1872, when I joined as a Staff Assistant Surgeon, and the *junior* of all the medical officers in the island; the second in January, 1899, when, by a curious reversion of circumstances, I joined as the *senior* medical officer of the Ceylon Command.

I have many pleasant recollections of Ceylon, and can never forget happy days spent there, nor the unvarying kindness and hospitality shown to me during both tours of service in that delightful island.

Clinical Notes.

A CASE OF RAYNAUD'S SYMMETRICAL GANGRENE.

By Major F. W. BEGBIE.
Royal Army Medical Corps.

On the afternoon of June 1, 1903, I was asked to see a native Cingalese female child, aged 9, whose right foot was extremely painful, and had "turned black" during the night. On closely questioning the father and child, the following history was ascertained:—

Their home was situated in a village some distance from Kandy, Ceylon, and about four days previously the child had first complained of severe pain in the right foot. Up to this date she had been in her usual health, which had never been of the best. On the day mentioned, namely, May 29, a severe thunderstorm had taken place, succeeded by a considerable fall in the temperature, which up till then had been very warm. The pain in the foot was referred to the dorsum, and was so severe as to prevent the child from walking. During the following night tingling in the toes set in, and the pain in the toes and foot increased in severity.

May 23.—The toes and foot were much swollen and the father thought the child had been stung by a poisonous insect.

May 24.—After a very restless night the child awoke to find all her toes and the distal portion of the foot had turned a dark black colour, and that the pain was somewhat less pronounced.

May 25.—The foot and toes were cold and the skin had become dry and shrunken.

On the fifth morning following the onset the disease had spread to the toes of the *left foot,* all of which became affected, starting with pain and going on to swelling, discolouration and numbness, and by the *seventh day* the left foot was in much the same condition as the right.

On the eighth day the fingers of the left hand, exclusive of the thumb, which the day previous had begun to be painful, became flexed and discoloured, but up to the evening of this date the right hand had not become affected. The father admitted illicit intercourse previous to the birth of this child, and stated that the child had been "born with a cold and breakings out near the anus." He had been married fourteen years and had had five children, four living, one dead. I inspected the remaining children, and found them all healthy. The patient, however, bore in her face, especially about the teeth and mouth, evident marks of congenital syphilis.

On the ninth day after the onset a well-marked line of demarcation had set in over the dorsum of both feet, more marked in right foot than in the left, but none was ever observed in the hands.

On the tenth day the fingers of the right hand, exclusive of the thumb, became affected and gradually passed into the same condition as the left.

Treatment.—Anti-syphilitic treatment was ordered from the first, combined with shampooing of the legs and arms with embrocation. The child was also given generous diet to carry her through the course of treatment. On the sixth day from the onset electrical treatment was commenced. The feet, and afterwards the hands, were placed in a bath, the wire from the anode was placed in the water, and the kathodal pole over the tibia and ulna and radius respectively, and a strength of two cells constant current, increased each day, as much as the child could bear it, until eight cells were in use (more the child could not stand); and finally the limbs were swathed in cotton-wool. The father brought the child to see me every day, and after three days' treatment the skin over the toes and feet began to lose their dried-up, parchment-like appearance, and there was a return of sensation in the big toes of both feet. The flexion of the fingers and the stiffness was less marked.

After eight days' treatment the fingers of the left hand had become normal, and all except the small finger of the right hand were also normal. The line of demarcation had receded from the dorsum to the base of the toes, and the skin over all the toes had assumed a more healthy appearance.

After ten days' treatment the fingers of both hands were as bad as ever, black, flexed, and intensely painful. The current was reduced, and three days later they were normal again.

After fifteen days' treatment.—Tendency for the colour to return in the fingers, and they are somewhat more painful again. The three outer toes on both feet have also gone back and are again more painful.

This intermittency in the improvement of the fingers and toes was a marked feature during the treatment.

After one month's treatment.—The hands and fingers are normal, sensation has returned, the big toe and two inner ones on each foot are, despite the intermittency, practically normal, but the three outer toes on each foot are still black and dry.

After six weeks.—There have been two slight returns of the pain and blackness in the inner toes, but none in the hands. The middle toe of each foot is much improved, but the two outer ones are, I fear, beyond cure.

After seven weeks.—The father has become tired of bringing up the child to see me, and I hear that a Buddhist priest has, "for a con-

sideration," promised to restore the remaining toes to life with charms and native medicines, so I regret I am unable to see the case through to a complete cure, but I intend in a few weeks' time to ride over to the village and ascertain how the faith in Buddha has progressed.

SEQUEL TO A CASE OF GUNSHOT WOUND OF THE CHEST.

By Surg.-Capt. DAVID M. GREIG.
1st Forfarshire R.G.A. (Vols.).

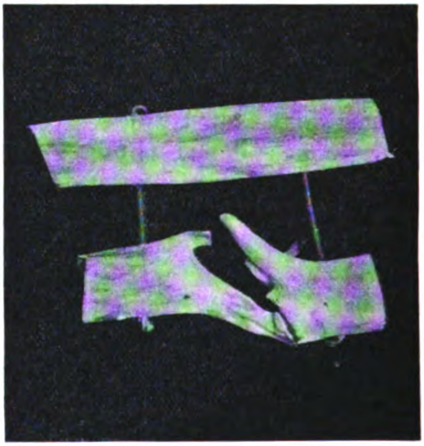
As it is often a source of regret to the Army Medical Officer that he cannot follow his cases after they have left the Service, it will surely be one of the functions of the Journal of the Royal Army Medical Corps to remedy this by opening its pages for the records of cases which may have come under the cognisance of those who hold appointments in institutions or civil hospitals where such cases may apply for advice. It is customary in other medical journals to hide the patient's identity under initials and absence of address; but I feel that Service cases ought often to be reported in such a way that the individual case could be recognised, and any previous or subsequent report amplified by the publication of the after history. For this reason I give such details for identification as I find in my notes on the following case.

Pte. George H. Potter, 1st Royal Highlanders, aged 28, was wounded by a Mauser bullet at the battle of Magersfontein on December 11, 1900. When struck, at a range of about 50 yards, he was lying down flat, resting on his elbows, and with both hands raised to his head, was turning his helmet. The bullet entered on the right side of the neck, and came out below the right scapula, where the cicatrices now are (*vide infra*). He felt severe pain about the lower part of the right chest, and thought he had been shot through the thorax. He almost at once found that he was spitting blood, and he loosened his belts and turned over on to his back. He then found that he had lost some power in the right arm and right leg, and that he had pain down the front of the right thigh and down the inner side of the right arm as far as the elbow. He was picked up by our ambulance thirty-six hours later and taken to hospital, where the lower wound was dressed and stitched, the upper one being entirely overlooked; partly because he was not undressed, and partly because he had no subjective symptoms at the wound of entrance. He was sent by train to Orange River, where on the fourth day after his injury he was undressed and the wound of entrance discovered and attended to. Two weeks later he was transferred to Wynberg. Both wounds suppurated. While at Wynberg he had pleurisy on the left side of the chest for four weeks,

and had that side painted with iodine. The wound was nearly healed when he left for home on February 1, 1901. On the voyage home he had pain along the wound, and this was relieved by having his right side painted with iodine. Since then, however, he has had a troublesome short cough, which catches him in front of the right chest. The impairment in the power of the right arm began to disappear when he was at Orange River, and of the leg about the middle of January. Since his return home he has had a peculiar spasmodic affection, which caused him to consult me, and which I shall describe presently. He was admitted to my care in the Dundee Royal Infirmary on February 23, 1901.

I found him to be a well-developed and well-nourished man. The scar of the wound of entrance was situated on the right trapezius margin, 1¼ inches horizontally from the seventh cervical spine. The wound of exit was represented by a scar about the size of a florin, half an inch behind the posterior axillary line on the tenth rib, and was freely movable. Pressure on the eighth, ninth, or tenth ribs caused pain at the site of injury. There was some hyperæsthesia to the right of the umbilicus and round to the injured ribs. There was no muscular atrophy, and the reflexes were normal. He complained of pain when he breathed, about the right side of his neck; but that pain was replaced by a much more severe one in front of the costal margin about the level of the ninth rib when he coughed, sneezed, or took a long breath. When standing he kept his head slightly bent and his chin turned towards the right side, and he held his right shoulder lower than his left. His breathing was shallow and was interrupted by a frequent slight cough, and to supplement his deficient respiration he sighed frequently, each sigh being accompanied by a most extraordinary spasm. This consisted in a spasmodic contraction of the right facial and platysma, the sterno-mastoid and the trapezius, and probably the scalene muscles as well. Each spasm jerked the chin sharply to the right side, and then carried it slowly to the left again. It was accompanied by a marked indrawing of the right side, as one sees in attempted forced inspiration in a case of recent fracture of the ribs. The "catch" in the breath resembled the spasm caused by sudden immersion of the body in cold water, but was confined to the right side. When he walked he rather swung his right leg, because he kept his pelvis steady, thus avoiding the use of the quadratus lumborum and the possible movement of his lower ribs. It will be recognised from the above description that the muscles concerned in the production of the spasm were the extra-respiratory muscles, while other muscles were at times kept in a state of tonic contraction to prevent undue movement of the right chest. The apparent explanation was that one of

the intercostal nerves had been caught in the cicatrix formed at the wound of exit, and the ordinary respiratory movements thus impaired. Had the condition been due to actual injury of the intercostal nerve by the projectile, the onset of the spasm and irritation would not have been so long delayed. As it was, the onset was coincident, not with the formation of the cicatrix, but with the contraction of the fibrous cicatricial tissue. The treatment was obviously the removal of the source of irritation. Two days later, therefore, the patient was put under chloroform, and I made an incision parallel to the ribs and below the cicatrix. A skin flap was turned up, and the free margin of the latissimus dorsi muscle was drawn backwards. The ribs were then exposed, and parts of the ninth and tenth ribs removed with the cicatricial tissue between them. The tenth intercostal nerve was then isolated and about 3 inches of it removed.



From the day of operation he was absolutely free from spasm, and was discharged from hospital on March 25. A month later he was able to ride his bicycle for forty-four miles against a strong head wind.

The macerated specimen depicted above shows the gap made in the tenth rib by the bullet. The spicules of bone projecting are fragments which had been broken at the time of the injury, and the way in which some of these project forwards while others project backwards shows how obliquely the projectile must have passed through the rib. It is worthy of note also that no necrosis of fragments occurred, notwithstanding that the wound suppurated, and, indeed, as one looks at the specimen now, though there has been some absorption of the edges of the bone-wound in the process of repair, there is no obvious lack of bone to fill in the hiatus left by the passage of the missile.

REPORT OF GUNSHOT WOUND OF ABDOMEN, WITH PERITONITIS AND OBSTRUCTION: ENTEROSTOMY—RELIEF.

By Capt. C. E. THOMAS.
New Zealand Rifles.

Gunner E., I.L.H., received a penetrating gunshot wound of abdomen immediately above bladder and slightly to the left of middle line, on March 22. He treked fourteen miles next day in an ambulance waggon to Klerksdorp Hospital, where he was admitted with peritonitis, which increased in severity until the 25th, when his condition was very low and fæcal vomiting frequent.

He was anæsthetised, and with a view to doing an enterostomy I made a curved incision 3 inches long in the right iliac region. On opening the peritoneal cavity turbid fluid escaped, and coils of collapsed gut presented in the wound, with the exception of a small knuckle of distended gut deep down at the upper angle of the wound. This was stitched to the abdominal wall in the usual way, no attempt being made at the time to find the cause of obstruction or to wash out the peritoneum. On opening the gut only flatus escaped. Four hours after the operation I poured 1½ pints of hot water into his stomach, which was immediately ejected with the œsophageal tube, which the patient could not retain. I repeated the procedure three times at intervals of five minutes, the last ejectment from the stomach being comparatively free from fæcal matter. At the same time, as nothing had passed through the artificial anus, I injected into it 1 drachm of glycerine, which was quickly followed by a copious soft motion. No recurrence of vomiting occurred, and the patient had very little pain. For a week after the operation the temperature remained normal, and by that time he was able to sit up in bed and smoke, and take a liberal diet, and motions passed by the natural orifice as well as by the artificial anus.

Beyond the formation later of a small local abscess in the tissues at the site of operation he had an uninterrupted convalescence, and is now anticipating the second operation, which will be necessary as soon as local conditions will permit.

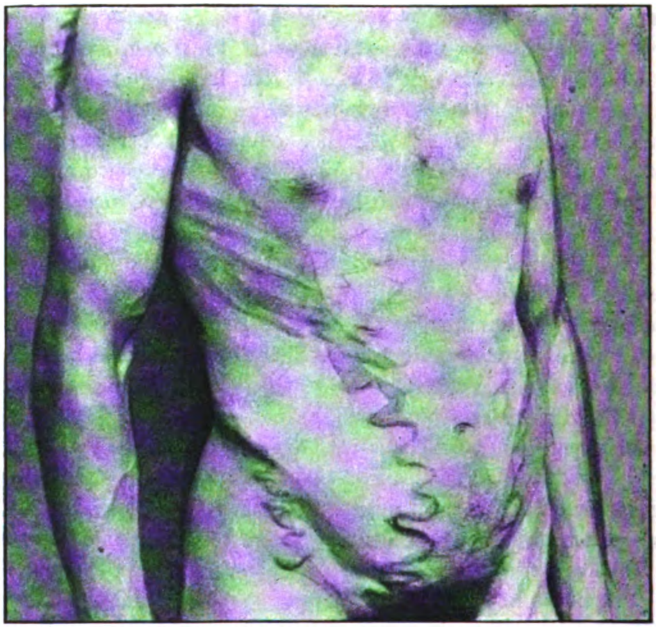
THROMBOSIS OF THE INFERIOR VENA CAVA FOLLOWING ENTERIC FEVER: RECOVERY, WITH ESTABLISHMENT OF THE COLLATERAL CIRCULATION.

By Civil Surg. I. MACKAY HUEY, M.B.

The rarity with which recovery follows thrombosis in the inferior vena cava marks the following case as one worthy of recording. Several cases of thrombosis in the inferior vena cava are reported, but accord-

ing to Keen,* only one case of recovery is recorded by Mackintosh,† of Glasgow, in which the collateral circulation was fully established.

The present case came under notice in June, 1903, one year after an attack of enteric. He was then under examination by a Board of Officers for an extension of his pension, having contracted the fever while on active service in South Africa. The President of the Board, Lieut.-Col. Corker, suggested having a photograph taken and asked me to obtain a few notes on the case for publication.



Lieut. M., aged 28, contracted enteric towards the end of the late war after serving throughout the campaign in a Colonial Corps, and was admitted to Hospital, therefore, at Boshof on April 5, 1902. From the temperature chart the course of the disease seems to have been marked by no untoward symptom. The patient, however, states that the medical officers informed him they had grave fears of his pulling through. His highest temperature recorded is 104° on the third day; it was normal for three days on April 19 to 21, and rose to 102° for four days following, but remained normal afterwards.

* "Surgical Complications and Sequels of Enteric Fever," 1898.
† In *Glasgow Medical Journal*, 1892, vol. xxviii., 54.

Patient is not certain as to the exact dates, but believes that his right leg became swollen about the end of May, that is, in the fifth week of his illness, and the left one two or three days later. The swelling was accompanied with pain and discolouration. Amputation of the left leg was at one time thought necessary (about three weeks after the onset of the complication), but the patient's weakness prevented interference, and on the following day the limb showed slight signs of improvement; it was then noticed that the abdominal veins were slightly enlarged and the increase was followed by lessening of the swelling in the legs and disappearance of the discolouration. The improvement continued up to his discharge on sick leave at the end of July, 1902. He was then able to get about on crutches.

Present Condition.—Patient looks healthy and is of good physique, his family history is good, and previous health excellent. On examination both legs are found swollen and œdematous; the small superficial veins round the ankles appear as dark arborescent markings under the skin. There is no marked varicosity in the veins of the legs. The epigastric veins are greatly enlarged and tortuous, and distinctly outlined as far as the chest, where they branch off and appear to anastomose with the mammary; the circumflex iliac is greatly enlarged on the right side as seen in the accompanying photograph. On the left side the enlargement is not so great, but varicocele is noticeable. Hæmorrhoids have developed and cause much annoyance. Patient suffers considerable pain on walking any distance or on standing. The heart sounds are pure though somewhat weak and rapid—92 per minute.

From the swelling appearing in the right leg a few days prior to the left it is possible the thrombosis originated in the right common iliac and extended into the vena cava. It is also possible that the thrombosis originated independently in both common iliacs. This latter condition would also give rise to the symmetrical establishment of the collateral circulation which appears fully established on both sides through the epigastrics, circumflex iliacs and hæmorrhoidals, with the mammary, ilio lumbar and inferior mesenteric.

DISEASE OF THE ARM AND HAND IN A NATIVE.

By Major A. PEARSE.
Royal Army Medical Corps.

This case was shown before the Medico-Chirurgical Society of Sierra Leone in August last, and gave rise to much discussion, though no definite diagnosis was arrived at by the meeting. The general opinion of the members present was in favour of its being a case of mycetoma.

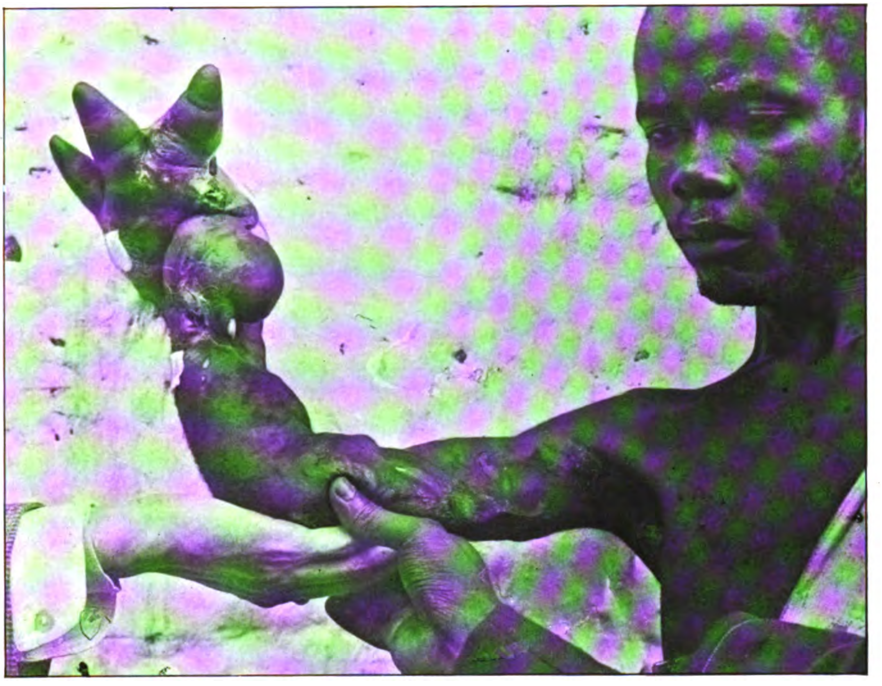
By way of treatment amputation high up was generally recommended as most appropriate for the case. For the following notes of the case I am indebted to Dr. Davson, of the Colonial Medical Service.

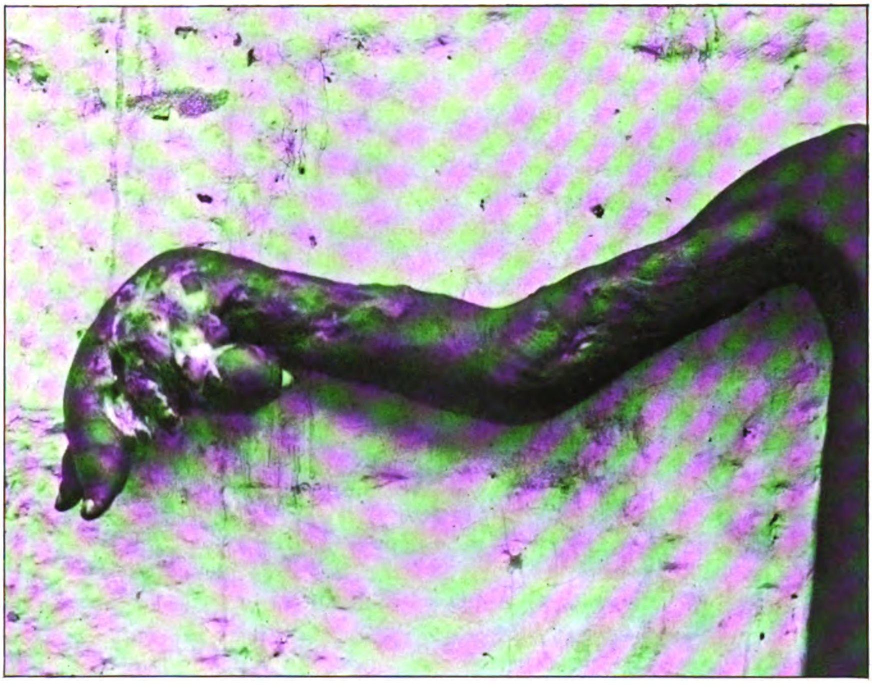
Sorie, a Mendis, aged about 30, came to the Colonial Hospital, Freetown, and stated that four years ago sores began to form on the lower part of his right arm and on the forearm. These sores healed up by degrees under native treatment, leaving solid round scars. Later a similar sore began to form between thumb and index finger of the right hand. This one did not heal like the others; but, extending deeply, destroyed the two distal phalanges of the index finger so that only the first phalanx was left at the time of his coming into hospital, which was covered with unhealthy granulations and discharging an oily-looking fluid. The ulceration had spread to the nearest sides of the thumb and middle finger, but there were no sinuses leading into the hand. The whole hand and the fingers were very much enlarged, the thumb looking as if it had been constricted at its base. The swelling felt very tough, and did not pit on pressure, nor did it extend above the wrist. There were some nodules round the edges of the old scars on arm and forearm, seemingly made of granulation tissue and covered with epithelium. A little serum taken from one of these and examined for lepra bacilli was not found to contain any. No anæsthetic patches were found about the body. There was no enlargement of the axillary glands, no scar on the penis, and there was no sign on the face or any other part of the body of similar ulceration. The blood was examined for *Filaria nocturna* and *diurna*, but none were found. A scraping from the ulcer was examined for the fungus of mycetoma, but none was found.

On October 8, 1903, the arm was amputated at the shoulder joint by Spence's method; treatment by potassium iodide in large doses having been tried, but failing to do any good. Patient made a good recovery. On cutting into one of the swollen fingers, after removing the limb, the tissues were hard, solid, and white, and it was impossible to see any distinction between connective tissue, tendon, muscle, &c.; it appeared homogeneous down to the bone. There were no sinuses and no cysts. The veins appeared to be thickened up the forearm and as far as the lower part of the arm. The reason for removing the arm at the shoulder was that it was thought advisable to make flaps above the seat of the old disease, which extended too high up the arm to allow of any operation lower down.

[This case, I should say, judging by its history and appearance. is not one of actino-mycosis, but is in all probability an example of the condition which is called botryomycosis. See following references :—

Botryomycose humaine. "Identity of Nature of Tumours of Papillomatous Appearance in Man, with the Botrymycosis or Champignon de Castration of the Horse," by MM. Antonin Poncet and Louis Dor.





To illustrate Disease of the Arm and Hand. By Major A. PEARSE.

(*Congres de Chirurgie de Paris*, October 18, 1897; and *Lyon Med.*, October 24, 1897, January 30 and February 6, 1898); "*De la Botryomycose humaine*, par Henri Chambon (*Thèse de Lyon*, 1897); "*Sur quelques Affections parasitaires observée en Algerie*," by E. Legrain (*Arch. de Parasitologie*, No. 1, 1898). An English reference to these is to be found in the *British Journal of Dermatology*, 1898, p. 209.

The most important *résumé* of the original observations on the whole subject is by E. Bodin, Professeur a L'Ecole de Medicine de Rennes, "*Sur la Botryomycose humaine*" (*Annale de Dermatologie*, p. 289, 1902).

The cases observed have nearly always been French ones up to the present. I here give a translation of cases according to his own experience. He says: "These observations incline me to the opinion that the botryomycotic tumours in the human subject are, as a matter of fact, only fleshly protuberances produced under the influence of the *Staphylococcus aureus*, and whose peculiar clinical aspect and pedunculated shape are due probably to peculiarities in the anatomical structure of the region in which they develop."

Some of the pictures that I have seen of cases of the disease are even more striking than the enclosed photographs; but the condition is of sufficient rarity, so far as our experience goes, to make it worth while noting if only to warn others. Of course, it is possible that this may be a case of actino-mycosis, though unlikely, or of blastomycosis, which appears to be a definite clinical entity. I do not think so, however. It is much more likely to be an example of the condition that the French have described under the name "botryomycosis."—J. Galloway.]

METHOD OF SECURING TRUSS.

A correspondent, who describes himself as the life-long wearer of a truss, recently brought to the notice of the Director-General what he claimed to be a simple and inexpensive method of keeping the pad of the ordinary truss in its place without the discomfort and inconvenience attaching to the strap between the legs. All that is required is about a yard of broad tape, or, better still, $\frac{5}{8}$ inch lamp wick. The wick is passed round the thigh and secured with a knot or half hitch, then round the truss near the pad, and tied down to the desired position. If properly adjusted the simple contrivance will keep the pad in its proper place in all positions of the leg, and the perineal band may be dispensed with, to the great comfort of the wearer.

The method has recently been given a trial by several medical officers, most of whom report favourably on it.

A CASE OF OBLITERATIVE ARTERITIS.

By Capt. H. P. JOHNSON.
Royal Army Medical Corps.

Kido Mentoe, a Hottentot boy, aged 11, was admitted to the Native Hospital, Clanwilliam, South Africa, from one of the columns, on June 16, 1902. He stated that he had been sick for about a week before admission, and complained of headache and pains in his legs. His temperature for seven days after admission was normal in the mornings, and 100° to 101° in the evenings; since then it has remained normal.

On June 25 it was noticed that his toes were very blue and insensitive, and I was asked by Civil Surgeon J. A. Black, who was in charge of the case, to see him. I found that both the femoral arteries were very hard and incompressible, and that the pulsation in them was very slight. The radial and temporal arteries were normal, and pulsation could be felt in the popliteals, but not in the tibials. The heart sounds were normal, and the boy, who was very intelligent, complained of nothing except pain in both legs and feet. He assured me that he had never had any sickness before, and this statement was borne out by his parents. The feet were ordered to be packed in cotton-wool, and small doses of iodide of potash were given. The condition of the toes gradually passed into one of dry gangrene, until, on the right foot, he lost the third, fourth and fifth toes, and the distal phalanx of the second, while the distal phalanx of the great toe commenced to separate. On the left foot the distal phalanges of the third, fourth and fifth toes were similarly lost, and a patch of gangrene formed on the ball of the great toe. At this time there was no pulsation in the femoral and popliteal arteries of either leg, and the common femorals could be felt as hard cords. The radial and temporal arteries were apparently normal. There was no heart murmur, but the pulse intermitted at every ninth beat. The feet gradually healed, the lad making a good recovery.

I have ventured to record this case as the affection is a rare one, and both Erichsen and Treves state that the youngest age at which it has appeared is 19 years.

Possibly the disease might be more accurately described as the endarteritis proliferans of von Winiwarter; but there has been no opportunity of examining the arteries microscopically, and I am of opinion that the two diseases are practically identical.

The chief point against the correctness of the diagnosis is the absence of the excruciating attacks of pain described by Pearce Gould and others; but I have most carefully, and, I believe, legitimately, excluded ainhum, leprosy, Raynaud's disease, syphilis, embolism, and ergot poisoning, which appear to be the only affections with which it could be confounded.

[We have published this case, as it appears to us to be of interest, having regard to the comparative rarity of the affection. A number of cases have been described from time to time, notably by Pearce Gould, Hadden, Spencer and Arkwright. The pathology has been specially studied by Winiwarter, Sternberg, Bunge, Wulff and Gould. The circumstances of the time appear to have quite precluded the making any histological examination of the parts which came away; but the case seems to have been a typical one of obliterative arteritis, occurring in a healthy lad, without obvious cause. Whether the final occlusion of the arteries in cases of this kind be due to thrombosis in vessels already diseased, or to a real proliferation of the intima without thrombosis, is still unsettled. The tendency to spontaneous cure or arrest indicates further the affection to be distinct from ordinary atheroma and from angiosclerotic or presenile gangrene. In Capt. Johnson's case there is no evidence of any of the visceral vessels being involved or affected, like those of the extremities; this has been noted by some observers, notably in a case reported by Arkwright. An interesting point has been raised by some observers, and that is the greater frequency of the disease in minute arteries rather than in the larger vessels. This has suggested the idea that possibly a nervous cause might be at the root of the affection; but we believe that examination of peripheral nerves have shown them to be normal in these cases. Could the existence of a nervous element be found it would be a valuable connecting link between cases of this kind and the various trophic disorders of the extremities in tabes, as well as with cases of Raynaud's disease and erythromelalgia.—EDITOR.]

VACCINATION.

By MAJOR W. T. MOULD.
Royal Army Medical Corps.

The following instance of the delay in taking after vaccination is curious. The lymph used was calf lymph, preserved in vaseline, and supplied by the Government Vaccine Depôt, Calcutta.

On December 6, 1903, I vaccinated six British soldiers and two Pathan sowars of Native Cavalry. They came for inspection on the 13th and 14th. Of the British soldiers the results were: One perfect, four modified, one failed. The Pathans had failed, there being dry scabs where the insertions had been made. On December 24 one of these Pathans was admitted to hospital, having fallen from his horse. Next day he showed me his arm, on which was a modified vaccine vesicle; he had been inoculated in three insertions. I then sent for the other sowar, and found him with two perfect results. They told me that there had been no result for a fortnight after the operation, and then they had found their arms painful on use, and after that the

vesicles developed. Neither of these men had ever been vaccinated before, and neither had marks of small-pox, but both said they had had it when small children.

I re-examined the British soldier, but there was no result.

FOREIGN BODY IN EYE.

By Major W. T. MOULD.
Royal Army Medical Corps.

C. R., a Scotch boy, aged 13, in the afternoon of November 13, 1903, was riding a pony, and while passing under a rim-tree a branch struck him in the face. He was seen half an hour later by an assistant surgeon, who found his conjunctiva scratched and a "black eye" with much swelling.

He was seen the next day by the medical officer, who noticed nothing unusual, and he was ordered a lotion to bathe the eye. The conjunctival wound healed, and all the swelling disappeared, except that a lump the size of a haricot bean remained in the lower lid, more apparent externally than when the lid was everted. I now saw the boy, and thought this was a hæmatoma and would absorb.

On December 28 the boy was running in a sack race at some sports, when he fell down, striking the eye, which bled. On January 3, 1904, I saw him again. Pus was now swelling up from the lower lid, and the swelling was hot and tender. I thought the hæmatoma had suppurated as the result of the blow, and ordered some boracic lotion. Next day, having put some cocaine solution in the lid, I everted it to explore the swelling. I then saw a small dark body at the bottom of the wound, and on removing it found a small piece of bark. On cleaning the wound, and probing the cavity, a hard body was felt and seen. I took hold of it with a pair of forceps, and with considerable difficulty withdrew the end of a twig of wood. This was $\frac{3}{4}$ inch long, $\frac{3}{16}$ inch in diameter at the base, tapering to a point $\frac{1}{16}$ inch diameter; at the base it was round and covered with bark, but the remainder was split up, being round and covered with bark on one side, flat and uncovered on the other, evidently the end of a broken-off branch. As I had to use force in removing it, I think there is no doubt it had penetrated the floor of the orbit, and it had all been covered by the conjunctiva. The eye was irrigated with boracic lotion, and he was quite well within a week.

Editorial.

DIPHTHERIA ANTITOXIN.

THE question as to how far, and under what conditions, diphtheria antitoxin loses strength by keeping is one of considerable interest to the military medical officer, who is often unable to obtain a freshly prepared supply. Our knowledge on the point lacks precision.

As a contribution to its advancement, analyses have recently been made of (1) samples of diphtheria antitoxin which have been on charge in military hospitals at home for a year; and (2) samples a year old, which during that period have been one or two voyages to India on transports. The latter samples were kept in the refrigerating chamber during the voyages.

The table shows the results of the tests.

Date of issue	Strength at date of issue	Laboratory at which tested	Date of test	Strength at date of test	Where kept
December 29, 1902	400 antitoxic units per c.c.	Conjoint laboratories of R.C.P. & R.C.S., London	March, 1904	400 antitoxic units per c.c.	Home Hospital
January 15, 1903	500 antitoxic units per c.c.	Ditto	Ditto	475 antitoxic units per c.c.	Home and two voyages to India on transport
January 1, 1903	333·3 antitoxic units per c.c.	Lister Institute	March 4, 1904	300 antitoxic units per c.c.	Home Hospital
January 21, 1903	700 antitoxic units per c.c.	Ditto	Ditto	700 antitoxic units per c.c.	Home and two voyages to India
January, 1903 (3 samples)	666 antitoxic units per c.c.	Messrs. Burroughs & Welcome's laboratories	March 14, 1904	Not less than 600 antitoxic units per c.c.	All these samples had been to India on transport
January 15, 1903	550 antitoxic units per c.c.	Ditto	Ditto	450 antitoxic units per c.c.	Two voyages to India

The serum was in each case obtained from Messrs. Burroughs & Welcome's laboratories.

They may be taken to uphold the general view that antitoxin retains its activity, little, if at all, impaired, for at least a twelvemonth—a matter of great practical importance to medical men in distant countries with no local sources of manufacture, as they are enabled to rely on supplies received from Europe. (This we understand to be the practice in Australia.)

As diphtheria antitoxin has no physiological but only a therapeutical action, loss of strength may be counteracted by increasing the dose, without any harm to the patient.

It is proposed to repeat the tests at longer intervals, and so attempt to work out a curve of deterioration.

ENDEMIC PLAGUE CENTRES IN AFRICA.

Missionaries and travellers in Uganda had mentioned a contagious and very fatal disease, called "kampouli" by the natives, which appeared at irregular intervals and somewhat resembled plague. The first reliable report on this disease was furnished by Stabsarst Luspitza, District Surgeon of Kubonga, in 1896. Unfortunately, he was unable to personally examine these cases and had to rely on missionaries' reports for his facts. The description, however, made it clear that the disease must either be plague or something very akin to it. Professor Koch, when staying in German East Africa in 1897, met Luspitza, who had come down to the coast, and discussed the subject with him. So convinced did Koch feel that this must be genuine plague, that he wrote home officially stating his belief that endemic plague centres existed in the interior of Africa, and he attributed the outbreaks of plague in Tripoli in the years 1856 and 1874 to the introduction of the disease by slave caravans from the interior of Africa. Having a great deal of other scientific work on his hands which he did not care to interrupt, he applied to the German Government to have Luspitza sent to Budu, German East Africa, for the purpose of investigating the disease and to obtain pathological specimens for Koch's examination. Luspitza meanwhile assisted Koch in his work and became acquainted with research methods. The German Government having sanctioned Luspitza's appointment, Koch drew up rules for his guidance and despatched him to the infected area. Luspitza arrived at Muanza in 1897, and after enquiring from the native chiefs, moved his camp to Grugati, one day's march west of Bukoba. Here he soon found five cases resembling plague and called by the natives "rubwianga." Clinically these cases resembled bubonic plague. Film preparations were made from the blood and swollen glands; after death a careful examination of the organs was made, and portions pre-

served in alcohol were sent along with the films prepared to Professor Koch. In all of these plague bacilli were present in large numbers. Compared with specimens made from plague cases in Bombay, Koch could not detect any difference. Luspitza also found many dead rats about the huts; preparations made from their blood and spleen showed numerous plague bacilli. Rats inoculated with a little blood from one of the cases died in two to three days, their blood also showing numerous bacilli. In a further report Luspitza states that he inoculated rats, two monkeys, and a goat, all of which died of plague. One sheep and two dogs were unsuccessfully inoculated. Luspitza also sent the following information obtained from missionaries in Budu.

In Uganda plague has been known from time immemorial. During King Mtesa's reign it raged in the capital, but at the present time it only occurs sporadically. It has gradually spread to the south and has occurred in Budu for the last thirty or forty years. It has several times crossed the Kagera Nile into Kisibe, the first occasion being eight years ago. In 1902 Feldman and Ahlbory reported a series of fatal cases in Bukoba, German East Africa, in all of which plague bacilli were found, besides others which were not examined microscopically. Feldman notes especially the occurrence of a large number of cases in which the clinical symptoms were only slightly marked, although plague bacilli were detected. Apparently culture tests were not applied, as he asks for a supply of media and guinea-pigs. The German writers state that the disease practically always occurs in villages which are situated in banana groves and whose inhabitants live on the fruit.

Christy failed to find any plague cases in Entebbe, Budu, Sese Islands, Masaka, Kiabogo or Bikira. Castellani met with one suspicious case in Uganda having enlarged glands and fever. Puncture of the buboes on two occasions failed to reveal bacilli, and culture experiments were unsuccessful.

MALTA FEVER.

In the Corps News there is published part of a letter from the P.M.O., Malta, in which he states that Malta fever has been exceptionally bad of late, and that the Medical Staff is quite too small to allow of much time for investigation work. It seems a great pity that there are not sufficient Medical Officers in Malta to enable

the P.M.O. to devote the whole time of some of them to the elucidation of such an important fever as Malta fever, an interminable disease which gives rise to so much sickness and invaliding in the Navy and Army stationed at Malta.

There can be little doubt that it is in the investigation of disease with a view to its prevention that our foremost duty lies. When a soldier has once incurred such a disease as Malta fever, little can be done by medicine, except what proper dieting and nursing can do. Nothing would be more popular, we are convinced, with the Army at large, or with the British public, than to see our efforts put out strongly in this direction. But in order to prevent disease, its natural history must be known, and this cannot be done without painstaking, persevering investigation. A man must give himself up to such studies *totus in illis*. Hardly anyone can combine routine hospital work, regimental work, care of families, attendance on Boards, *et genus hoc omne*, and the wresting of secrets from Nature. Therefore, in time of peace, we would like to see many of our officers engaged wholly in prevention work. To enable us to do this, of course, our numbers would require to be added to.

It seems only right that the R.A.M.C. should be over-officered in times of peace, as all other parts of the Army are, in order that they, too, may prepare for war. It is not during the excitement of war that Commissions for the study of typhoid and dysentery, with a view to their prevention, should be formed. This work, we repeat, ought to take up the whole time of many of our officers during peace times. Thus would be formed a section of our Corps whose whole duty would be to investigate matters pertaining to the prevention of disease in armies. Under suitable advice these officers would be sent all over the world to investigate questions similar to this important problem which faces us in Malta. One thing that can be done at present to relieve Medical Officers is to simplify routine work as much as possible, and so relieve one or more for prevention work. It is not every Medical Officer who has the taste or inclination for research work, he may prefer hospital duties; another may have a distinct bias for laboratory work and the investigation of problems of prevention. Nothing, then, can be simpler than for the former to relieve the latter of his routine work and so leave him free to pursue a line of work which we all agree is most

important, and which will increase the usefulness and reputation of the R.A.M.C.

One thing appears perfectly clear, at least to our mind, and that is that no stone should be left unturned, no amount of labour thought too much, to enable us to gain a knowledge of the natural history of Malta fever, and so in time to prevent the occurrence of so many cases of this plague among our soldiers and sailors in the Mediterranean.

Echoes from the Past.

THE ARMY SURGEON AND THE CARE OF THE SICK AND WOUNDED IN BRITISH CAMPAIGNS DURING THE TUDOR AND EARLY STUART PERIODS.

By Capt. H. A. L. HOWELL.
Royal Army Medical Corps.

Part I.

The revival of learning, which followed the fall of Constantinople, was also associated with advances in medicine and surgery. The works of Hippocrates and Galen were printed and became better known, and during the sixteenth century we find an increased literary activity and more originality amongst the British physicians and surgeons. Not only were the classical writers studied in the original, but we find the medical man learning new lessons in the school of experience, and discovering the limitations of the old teachers. When Paracelsus publicly burnt the works of Avicenna, he was protesting against the shackles fastened on progress by the slavish adherence to the teachings of the past. Original observation of disease was encouraged. although Galen still remained the chief guide to practice. Paracelsus wrote a good description of "hospital gangrene" and was the earliest writer to connect goitre with cretinism. John Kaye (or Caius) wrote an original description of the "sweating sickness" which was then epidemic in England. Lithotomy was improved by the use of the staff and other instruments of the "apparatus major," and the radical cure of hernia by means of sutures superseded the older method of operation by the actual cautery. We will note further on the improvements in army surgery associated with this century.

An increased knowledge of their art led the qualified physicians and surgeons to endeavour to save the public and the soldier from the malpractices of the ignorant. To do this, attempts at the organisation of the faculty was made. In 1540 the Fellowship of Surgeons was amalgamated with the Company of Barber Surgeons, and the practice of surgery was thrown open to all and sundry. Henry VIII. appears to have taken an interest in the

new society, and Holbein's great picture of the King in the midst of the Barber Surgeons bears witness thereto. The newly organised company was known as "The Masters or Governors of the Mystery and Commonalty of Barbers and Surgeons in London." An Act of Parliament in the following year exempted army surgeons from "bearing arms or being put on watches or inquests." In the same reign Linacre, one of the King's physicians, obtained, in 1518, through Cardinal Wolsey, letters patent from the King, incorporating himself and other physicians as one body. Thus originated the Royal College of Physicians. Their chief privilege was the power given them of preventing anyone from the practice of physic within seven miles of London except by a licence granted by them. This monopoly was a cause of bitter contention between surgeons and physicians for many years, the latter endeavouring to prevent the surgeons giving internal remedies; and, as late as 1632, the physicians obtained an Order in Council forbidding surgeons to perform major operations unless a physician was present.

In 1505 the surgeons of Edinburgh had been incorporated under the denomination of surgeons and barbers. We learn that the members of the new College were required to be able "to read and write, to know anatomie, nature and complexion of every bodie of the human bodie, and lykewys to know all the vayns of the samyn that he may make flewbothomie in due time, together with a perfect knowledge of shaving beards."

Notwithstanding the existence of these colleges numerous unqualified practitioners existed, and the army appears to have become the refuge of many ignorant quacks. Gale's description of them is worth quoting. He says, "I remember, when I was in the wars at Muttrel, in the time of that most famous prince, King Henry VIII., there was a great rabblement there that took upon them to be surgeons. Some were sow gelders, and horse gelders, with tinkers and cobblers. This noble sect did such great cures that they got themselves a perpetual name, for like as Thessalius's sect were called Thessalians, so was this rabblement, for their notorious cures, called dog-leeches; for in two dressings they did commonly make their cures whole and sound for ever, so that they neither felt heat nor cold, nor no manner of pain after. But when the Duke of Norfolk, who was the General, understood how the people did die, and that of small wounds, he sent for me and certain other surgeons, commanding us to

make search how these men came to their death, whether it were by the grievousness of their wounds, or by the lack of knowledge of the surgeons; and we, according to our commandment, made search through all the camp, and found many of the same good fellows, which took upon them the names of surgeons, not only the names, but the wages also. We asking of them whether they were surgeons or no, they said they were. We demanded with whom they were brought up; and they, with shameless faces, would answer; either with one cunning man or another who was dead. Then we demanded of them what chirurgery stuff they had to cure men withal: and they would show us a pot or box, which they had in a budget, wherein was such trumpery as they did use to grease horses' heels, and laid upon scabbed horses' backs; and others that were cobblers and tinkers, they used shoemakers' wax with the rust of old pans, and made therewithal a noble salve, as they did term it. But in the end this worthy rabblement was committed to the Marshalsea, and threatened by the Duke's Grace to be hanged for their worthy deeds, except they would declare the truth what they were, and of what occupation, and in the end they did confess as I have declared to you before."

In the 48th Article of Henry VIII.'s "Statutes and Ordinances of Warre," it was directed that every soldier should "bear a cross of St. George, sufficiently large upon the payne, that if he be wounded or slayne in the default thereof, he that so woundeth or slayeth him shall bear no paine therefore." The late Surg.-Gen. Gore, A.M.S., commenting upon this Article of War, says: "The red cross on the white ground thus appears to have protected the wearer in our army, when wounded, long anterior to the date of the Geneva Convention." The Article, however, does not support this opinion. It is merely a repetition of one of the Ordinances made by Richard II., in 1386, and points out that the red cross of St. George was the distinguishing part of the uniform of the English soldier which protected him from being wounded or killed in mistake for the enemy by his own side. During the Tudor reigns soldiers were known as "white-coats" from their uniforms. The origin of red as the royal colour is said to be due to Henry VII., who adopted the colour from the "red fiery dragon" on the banner of Cadwallader, the last of the Welsh kings, from whom he was fond of tracing his descent. Scarlet

and purple were reserved as royal colours by Henry VIII., and the first English soldiers to wear red were the Yeomen of the Guard —the first permanent English corps of trained soldiers in our history—established by him as a royal body guard. The red coat as the distinguishing uniform of the British soldier really originated during the great Civil War.

In the establishment of the army sent to St. Quintin's in 1557* we find fifty-seven surgeons were attached to the army, which consisted of 500 heavy horse, 500 light horse, 4,000 foot, and 200 pioneers, with a complement of officers, and an artillery train. The surgeons were distributed, two to the staff of the Captain-General, one to the Lieutenant-General, one to the High Marischal, one to the General of the Horsemen, one to the Captain-General of the Footmen, and one to the Master of the Ordnance. The remaining fifty were distributed amongst the horse, light horse, and infantry in the proportion of one to every hundred men. A surgeon of horse was paid 2s. a day, of light horse 1s. 6d., and of infantry 1s.

The ordnance and pioneers had no surgeon attached to them. The surgeon to the Master of the Ordnance who received 1s. a day is the first artillery medical officer mentioned in our history. One shilling a day appears to have been the pay of the other surgeons in the suite of the great officers. The pay of the ensign, the chaplain, the sergeant, and the drummer and fifer was also 1s. a day. A body of horse is for the first time called a troop in this list of 1557. There appears to have been great difficulty in providing this large number of surgeons for the army. The fact is, there were not many properly qualified surgeons in England at this time, in 1513 ; there were only twelve in the whole of London.

Queen Mary had always the soldiers' interests at heart, and they derived two substantial benefits from her. The soldiers who went to St. Quintin's obtained 8d. a day, the sum for which they had mutinied in her father's reign. This remained the soldier's daily pay for two hundred years. In her will she left provision for a house in London with an endowment of 400 marks a year, "for the relief, succour and helpe of pore, impotent, and aged soldiers, and chiefly those that be fallen into extreme poverte, having no pensyon or other pretense of lyvyng, or are become

* Harleian MSS., No. 6,844.

hurte or maymed in the warres of this realm or in any service for the defense and suertie of their prince and their countrey, or of the domynions thereunto belonging."

The most eminent of the army surgeons of the early Tudor period was Thomas Gale. Gale was born in London, in 1507, and was, later on, apprenticed (with John Field, another well-known surgeon) to Richard Ferris, one of the chief barber-surgeons of his time. Ferris became Sergeant-Surgeon to Queen Elizabeth in 1562. Gale served in the army of Henry VIII., and was present, probably with other surgeons, at the siege of Montreuil, in 1544. At Montreuil, or Muttrel, he refused to imperil the lives of eleven soldiers by attempting to remove bullets, the position of which he was uncertain. He also served with Queen Mary's forces, sent to the aid of King Philip of Spain, at St. Quintin's in 1557. After leaving the Army he settled in practice in London, and became Master of the Company of Barber Surgeons in 1561. In 1563 he published "The Institution of Chirurgie." This book was dedicated to Lord Robert Dudley, and contains probably the first account of gunshot wounds and their treatment ever written by an English army surgeon. He also wrote on "Wounds, Fractures and Dislocations." In his writings he combated the generally accepted opinion of his time that bullet wounds were of a venomous nature. He denied that bullets acquired heat whilst in motion, and that bullet wounds in any way resembled those made by a cautery. In cases of hæmorrhage he recommended the use of a styptic powder, the ingredients of which were alum, lime, arsenic, and strong vinegar. These were to be mixed and applied by means of tow covered with white of egg. In 1566 and 1586 he produced other works, one being a translation from Galen. In his works he frequently refers to the intrusion into medical practice of illiterate pretenders, and we have already quoted his picture of the state of military practice in the time of Henry VIII. In the early part of Elizabeth's reign he represented to her the unsatisfactory position of the army surgeon and the difficulty there was in providing a sufficient number of qualified surgeons for military service. He wrote "I have myself helped to furnish out of London in one year seventy-two surgeons, who were good men, which served by sea and land, and were well able to serve, and all Englishmen, and yet the most part of them be in noblemen's service, so that if we should have need, I do not know where to find twelve suffi-

cient men." It is probable that the parsimony with which Elizabeth treated her soldiers materially diminished the supply of surgeons for the army. That "trusty old soldier surgeon," Thomas Gale, died in 1587.

We gather from the military writers of the period that the necessity for a sufficient supply of efficient army surgeons, and even of stretcher-bearers, was already recognised. In 1587, Barnaby Rich's "Pathway to Military Practice" appeared. In this book appears the passage, "A good and skilful chyrurgeon is a necessary man to bee had in a companie, such a one as should work according to art, not practisinge new experiments upon a poore souldier, by means whereof many have been utterly maymed by a chyrurgeon's practice that otherwise might have doon very well." Digges, in his "Stratiocon," pointed out the need of an organised arrangement for the collection and removal of the wounded from the field. He says, "It were convenient to appointe certaine carriages and men, of purpose to give their attention in every skirmishe and incounter, to carry away the hurt men to such place as surgions may immediately repayre unto them, whiche shall not only greatly incourage the souldior, but also cause the skirmishe to be the better mainteined, when the souldiors shal not neede to leave the fielde to carry away their hurt men." Such an arrangement existed at this time in the Spanish Army; and, the Spaniards also had a field hospital with their army as early as 1484, in which year Queen Isabella of Spain had an army of 18,000 men in the field at Antequara, and caused to be established six large tents, with beds, and all things necessary for the sick and infirm. In 1597, at the siege of Amiens, King Henri Quatre made similar arrangements, probably at the instance of Ambroise Paré, and the boon was so greatly appreciated by the soldiers that the campaign became known as the "Velvet Campaign." The first stationary hospital was established at Pignerol in Louis XIII.'s reign, and the Hôtel des Invalides, in Paris, was erected by Louis XIV. In England, St. Thomas's Hospital was founded in the reign of Edward VI., and this hospital, together with St. Bartholomew's, was open to the sick or wounded soldier.

Although cannon had been in existence since the reign of Henry III., and were first used in the open field at Creçy, the introduction of gunpowder did not materially affect the operations of war until the sixteenth century. During this century

the use of the bow began to go out of fashion, and the use of fire-arms became more general, and gun and cannon shot wounds became more and more common in war. The new species of wounds were appalling to surgeons and wounded alike. We find the questions of the poisonous nature of the powder, and of the falls projected by it, and the heat supposed to be generated by the passage of the projectile through the air, frequent subjects of discussion in the works of the earlier writers on gunshot wounds. Gale, in England, and Paré, in France, were the first to combat these ideas of the venomous characters of gunshot wounds, although these opinions were very generally held for many years after their time. Boiling oil was a very favourite remedy for these wounds for a long period. Prayers, incantations, exorcism, and charms, were also regarded as part of the treatment of those wounded by these "devilish engines of warre." John de Vigo, a sixteenth century writer, recommends for the "curation" of gunshot wounds, "to cauterise them with oil of elders, mixed with a little treacle." Grose quotes the prescription of an unknown surgeon in 1536: "Boil in two pounds of oil of lilies, two new-whelped puppies till the flesh fall off their bones; add some earthworms in wine, then strain and to the strained liquor add two drachms of turpentine and an ounce of spirit of wine." We read that this preparation, "oil of whelps," enjoyed a great reputation in the treatment of gunshot wounds. Other surgeons dilated the wounds with tents and applied aromatic oils. Paré, who belongs to this centu·y, at first used the actual cautery and boiling oil, but soon gave these up and app!ied milder remedies. At the siege of Metz, in 1553, one "Maitre Doublet performed strange cures with simple white linen and clean water from the fountains and wells." The great French army surgeon of Henri Quatre's campaigns was Ambroise Paré, and to him many marked improvements in the practice of surgery are due. He introduced the ligature of arteries and also employed a tight band around the limb to check hæmorrhage during amputations. He also used a mixture of turpentine, aromatic oils, and alcohol in the local treatment of hospital gangrene. We have not the space to give an account of this great army surgeon. Suffice it to say, in the words of the late Sir William MacCormac, "the surgery of the middle ages was a trade; Ambroise Paré and Jean Louis Petit converted it into an Art."

During the reign of Elizabeth the British army surgeon saw active service in many campaigns. He was brought into contact with plague during the siege of Havre in 1562. The Earl of Warwick had been sent with a large force to Normandy to aid the Protestants, but our allies made peace with the French Court, and then joined in an attempt to expel the English garrison of Havre. Plague broke out during the siege and Stowe says "slew daily great numbers of men, so that the streets lay even full of dead corpses." The English held out for two months and then capitulated on honourable terms. The return of the troops to England in 1563 led to an epidemic of plague in London.

The army surgeon accompanied the Earl of Leicester and Sir Philip Sidney, with 1,000 horse and 5,000 foot, in the expedition of 1585-86, to the aid of the Netherlanders, and were at Zutphen, where noble Sidney fell.

In 1588 a fleet of 140 ships and three armies—one of 30,000 men, to attend the Queen and act as a reserve, one of 20,000 men on the south coast, and another of 20,000 men at Tilbury—were raised to resist the Spanish Armada. In the list of these armies we find that the pay of the surgeons to the "Lances" and "Light Horse" was 1s. 6d. a day. This was also the pay of the guidon, trumpet, and clerk.

From the pay lists of Essex's army in Ireland, signed by Queen Elizabeth on April 24, 1598, we learn that each company consisted of a captain, lieutenant, ensign, surgeon, two sergeants, one drummer, and ninety-four men. The surgeon received the same pay as the sergeant and the drummer, namely, 1s. a day.

These appear, however, to have been the lower ranks of surgeons, for in the list of the army under Lord Mountjoy in Ireland, in 1599, we find that the Lord Deputy's doctor of physic received £5 a week. Sixteen surgeons were also paid, according to rank, the chief at £5, the others at 50s. and 40s. per week. We find that Elizabeth deducted from the pay of her soldiers in Ireland sums on account of clothing supplied. Amongst those affected by these deductions were the lower ranks of surgeons. Hennen quotes a letter written by an Elizabethan military officer, Sir John Harrington. "Every captain of one hundred footmen doth receive weekly, upon every Saturday, his full entertainment of twenty-eight shillings. In like case, every lieutenant fourteen, our ensign seven, our sergeant, *surgeon*, drum and fife, five shillings

pay, by way of imprest, and every common soldier three shillings delivered to all by the poll weekly. To the *four last lower officers* two shillings weekly, and for every common soldier twenty pence weekly is to be answered, to the full value thereof in good apparel of different kinds." The "good apparel of different kinds" for the "four last lower officers" were given in a list as follows: "In winter—a cassock of broad cloth with bays, and trimmed with silk lace, 27 shillings and 6 pence. A doublet of canvass with silk buttons, and lined with white linnen, 14 shillings and 5 pence. Two shirts and two bands, 9 shillings and 6 pence. Three pairs of kersey stockings, at 214, 7 shillings. Three pairs of shoes of neat's leather, at 214, 7 shillings. One pair of venetians,* of broad Kentish cloth, with silver lace, 15 shillings and 4 pence.

"In summer—Two shirts and bands, 9s. 6d. Two pairs of shoes, 4s. 8d. One pair of stockings, 2s. 8d. A felt hat and band, 5s. 5d."

The list is interesting; the yearly supply of shoes was liberal, but only one pair of trousers appears to be insufficient for a campaigner among the bogs of Ireland.

The pay of the lower ranks of surgeons, as laid down in these lists, does not include the whole of the emoluments he received. The MS. of Ralphe Smithe, an Elizabethan soldier, quoted by Grose, says: "That every souldier, at the paye daye, doe give unto the surgeon 2d., 'as in tymes past hath been accustomed,' to the augmentation of his wages; in consideration whereof, the surgeon ought readilie to employ his industrie uppon the soare and wounded souldiers, not intermedlinge with any other cures to them noysome. . . . Such surgeons muste weare their baldricke, whereby they may be knowen in the tyme of slaughter; it is their charter in the field." A "baldrick" was a cross-belt, passing over one shoulder and under the opposite arm. It is conceivable that it was used to carry a pouch, containing bandages and other dressings for wounds, and was, in this way, distinctive. A baldrick supporting a sword was in use at this time, and was, during the Stuart period, the most common way of carrying it. Grose says that in his day, 1730-1791, the baldric as a protection for their vocation, when on active service, was unnecessary, because every surgeon was easily distinguished by the apparatus of bandages, &c., he carried when on duty in the field.

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* Venetians—a sort of long trousers (Grose).

The captain of the company was directed to see that the surgeon of the company was in possession of "all oyles, balms, salves, instruments, and necessary stuffe to them belonging," and the captain also had to arrange for the carriage of the same. Ralphe Smithe leads us to believe that the surgeon was required to find all necessary medicines, &c., out of his pay. He writes: "Regarde that the surgeon be truely paid his wages, and all money due to him for cures, that bye the same hee maye bee able to provide all such stuffe as to him is needful."

(*To be continued.*)

REPORT OF THE ROYAL COMMISSION ON THE WAR IN SOUTH AFRICA.

As the actual volumes of this important report are unlikely to be accessible to the majority of members of our Corps, while the evidence contained in their pages cannot fail to be of interest to our readers, we propose giving a *précis* of the evidence so far as it relates to medical organisation before and during the late campaign. For this summary, which is continued from p. 508, vol. ii., we are indebted to Lieut.-Col. Edwin Fairland. It deals mainly with evidence regarding medical equipment.

VI.

(Q. 3954.) The men were inclined to hold on themselves, were they? Yes; poor fellows, they came in worn out and in rags. These camps should always be under the command of a Medical Officer; he lives amongst the men, he knows those that are fit to go out, and those who are not. Whereas if the camp is under a Military Officer, he (the Medical Officer) comes over for half an hour, pays a casual visit, and cannot know the men. . . . Another unit is an officers' hospital; and one that should not be forgotten is a nursing sisters' hospital; lastly, an infectious diseases hospital and a native hospital. All these we found, by experience, in South Africa were necessary.

. . . Sir William Wilson laid great stress on our own Mark V. It is a good ambulance in its way; but it broke down almost as much as any other. The best pattern I have seen is the Australian. I agree with him about the two-wheeled carts for Cavalry and Horse Artillery, or any quickly moving units; but they are not comfortable for badly wounded men.

What I liked about the Australian waggons was that they were lower, they were quite as strong, were lighter, and they could be drawn by six mules; whereas it took ten to draw ours.

(Q. 3961.) The next point is about the regimental establishment. It was laid down that every regimental unit should have "a medical cart" and a Maltese cart; but when we started in South Africa it was ruled that only Mounted Corps should have them, as the Infantry would be in a very awkward situation—stretchers in one cart, medical equipment in another, all mixed up with regimental baggage. To remedy that, at Bloemfontein, we bought carts and marked them "medical carts." I have nothing but praise for hospital trains; they saved the situation many times, they were the greatest possible comfort. Whenever there was an action we could have one at the shortest notice,

and get the wounded away with the greatest expedition and ease. I sent large convoys down in covered trucks, Medical Officers were in charge, and I never heard any complaint. Altogether we sent 5,000 or 6,000 men from Pretoria in that way. It is all a question of sorting your cases.

I am in favour of having a sanitary officer at the headquarters of each Army Corps. At Bloemfontein, where we suffered heavily, it would have been a very great thing to have had a sanitary expert to turn to. We often read in the papers that some 14,000 men died of disease; but the public forgets that there were 400,000 men in South Africa. How many of those men would have died at home or in the Colonies in time of peace? Exclusive of South Africa, the death-rate in the Army for 1900 was about 9 per 1,000, so that in common fairness the equivalent of the normal mortality should be deducted from the total casualties.

In 1897 the late Director-General appointed a Committee to report on equipment, by whom it was thoroughly revised and brought up to date. We heard no complaints about it in South Africa; there were a few things superfluous and a few deficient, but it stood the test admirably. Another piece of good fortune was the establishment of the Central British Red Cross Committee. It was the greatest help to us both at home and abroad. Then the Army Nursing Reserve formed about three years before the war was also a great help. It gave us about 800 or 900 nursing sisters at a critical time—all of them, with few exceptions, of a good stamp. We also have nearly 2,000 of the St. John's Ambulance Brigade, and they were of great assistance. We have no reserve now, except of our own men, who pass into it after three or seven years' service, and go away into civil life. There are required for one Army Corps 122 Medical Officers and 729 N.C.O.'s and men.

(Q. 3980.) Have you any proper means of gaining information about the medical stores and equipment of foreign armies? Occasionally one of our officers goes over and inspects them. I have seen the French and Italian armies myself, and think we have very little to learn from them. It would be an immense advantage if there was a regular system for our Medical Department, studying the newest methods adopted by foreign armies.

(Q. 3991.) Who makes the contracts for medicines? We have Government contractors, one for equipment and one for medicines. The contracts are renewed every three years. The Ordnance Department provides tents, bedding, bedsteads, &c. The present hospital tent is an atrocious pattern; it could not be worse.

(Q. 3997.) I do not anticipate the smallest difficulty in providing for medical requirements promptly in the event of war breaking out

by purchases from the trade. We have the greatest city in the world at our back. The only thing you cannot lay your hands upon at once is field medical equipment, such as panniers—they take about three months to build. It is a great mistake to store a huge amount of supplies—they are perishable articles and soon become obsolete.

(Q. 4004.) After officers have joined the RA.M.C. what opportunity have they of following out their profession? They go through the Medical Staff College on the Embankment, where they are taught hygiene, bacteriology and different things. Then they go to Aldershot for equitation, company drill, field medical training, building field kitchens, and military law. Then they are posted to station hospitals all over the country.

This course teaches them what they are supposed not to have been taught before. It gives them a start in military life. In war, regiments have officers attached, but not in peace.

(Q. 4010.) The officers in station hospitals could not get very much experience in attending merely sick soldiers? No, they would do the ordinary routine work. You must remember that dealing with soldiers and dealing with civilians are two very different things. In civil hospitals you often have men who are chronic invalids, but we do not keep chronic invalids in the Army.

(Q. 4011.) But there would be very few operations among a body of soldiers? I think there are many mistakes about that. There are a good many operations done in military hospitals, some major and a great many minor operations.

(Q. 4014.) Do you not think it should be a part of the duty of the younger officers to "walk the hospitals," as it is called? Yes, it should be part of the routine. Under the new warrant an officer has to pass a series of examinations, and if he shows marked proficiency he can get a jump in promotion. They are intended to be practical as well as theoretical.

(Q. 4018.) Our officers would, 90 per cent. of them, gladly avail themselves of the opportunity of attending hospitals; but two things militate against it. One is shortness of numbers, with the difficulty of getting leave; and the other is the perpetual foreign service. This might be mitigated by posting officers on the active list to appointments within 50 miles of London, from which they could run up to visit the hospitals. There are very good hospitals also at Birmingham, Leeds and Manchester.

(Q. 4019.) The orderlies have not been sufficiently trained; but under the new system there are going to be great changes. The tendency of the men is to get away from nursing duties, and the new rules encourage them to become good nurses, the best men going to the

nursing section and getting the greatest rewards there. Few men are born to be nurses.

(Q. 4024.) Col. W. Johnston, being examined, said he was Assistant Director of the A.M.S., in succession to Col. Gubbins. He had to do with the mobilisation of the Eighth Division, the Fourth Cavalry Brigade, seven general hospitals, and all the private hospitals, besides thirty Militia Battalions. The only difficulty was to get suitable officers and men; all the best had been sent out before. We were so pinched we had to place one of the general hospitals in charge of a retired medical officer, and another in charge of a militia medical officer. He also sent out 380 nurses from the Army Nursing Service Reserve; it supplied us with really capital nurses. Her Royal Highness Princess Christian personally interviewed every candidate.

(Q. 4039.) The mobilisation worked satisfactorily. The mistake was that the estimates were too small. It was contemplated that if two Army Corps and two Cavalry Brigades were sent abroad the Home Stations would be filled by civilians and retired medical officers. But the estimate for the N.C.O.'s and men is framed, not on any war footing, but for the requirements of the Home and Colonial Stations. The authority for this is defined in paragraph 2 in the "Mobilisation Instructions for the A.M.S." The estimate for the officers is on a war footing, and that for the men for peace requirements. It was not until June, 1898, that the officers and men were amalgamated. I think if we were to estimate the number based on the requirements of three Army Corps and three Cavalry Brigades we should have sufficient for any war likely to arise. We need not have all actually enlisted; but there should be skeleton *cadres*, to be filled in from reservists, &c.

(Q. 4042.) We had no provision for the lines of communication. I would embody a certain *cadre* for them to be expended when necessary. They cannot be ignored.

(Q. 4044.) Civil surgeons could not replace R.A.M.C. officers in charge of hospitals and bearer companies; they know nothing of the organisation, or the discipline, or mode of procedure. A military hospital is absolutely different from a civil hospital. In the former the medical officer is responsible not only for the treatment of the sick, but for their equipment, clothes, food and everything, and he is also in disciplinary charge of the *personnel*. In a large hospital you would require six or seven R.A.M.C. officers, assisted by some twenty or thirty civil surgeons.

(Q. 4050.) Do you agree with Col. Gubbins that it would be useful for young army medical officers to be compelled to walk the hospitals? I think it would be most useful for them to be encouraged to enlarge their professional experience; and under the present scheme it is hoped

that the increased establishment will enable officers to get leave for purposes of study. Hitherto the answer has always been, "we have not enough men; we cannot spare you."

(Q. 4051.) I see in the Report of the Royal Commission, reference is made to a certain feeling of distrust among military officers of the skill and professional experience of doctors of the R.A.M.C. as compared with civil doctors. It is stated on p. 11, "to a great extent we believe this mistrust to be ill-founded. That it is not wholly unfounded is to be explained by the difficulties under which the officers of the R.A.M.C. have hitherto laboured." If these gentlemen, the junior officers, had the advantage that civil surgeons have of studying in hospitals, there would not be this feeling of distrust. No, there should not. But I am afraid that the feeling exists because, by some, the medical officer in the Army is expected to be a Treves in operative surgery, or an expert in some other branch of the very first class. The Army Medical Officer is, as a rule, superior to the general practitioner; but what they compare the poor army doctors with are the most specialised and experienced men. We cannot expect to have the same opportunities as those men who are operating every day of their lives; these men never do anything else. This distrust is very painful to every member of the medical service.

(Q. 4054.) Do you find that distrust is general? I do not know. It exists, perhaps, in certain corps more than in others, and I think there is a little bit of fashion in it. But I am not very much in touch with the Service now. I retired ten years ago, and came back because of the war. I was invited back because I had been in office before, and they were so hard up for men that they asked the retired officers to come back and do work. This distrust used not to exist, but in some quarters it has grown up.

An Army doctor is a general practitioner in the fullest sense of the word. It is unfair to compare us with these specialists.

In the war there were 9 consulting surgeons, 476 medical officers and 385 civil surgeons; that is, 394 to 476 = 75 per cent.

(Q. 4061.) It was a necessity to have this admixture; the country could never afford to have all the medical officers necessary for a big war. Perhaps a little jealousy was inevitable between the two branches. Some of the hospitals were most comfortable, others not quite so much so.

(Q. 4066.) I think we could have got even more than the 380 nurses we dispatched; we picked out the very best. I think there will always be plenty of female nurses.

(Q. 5483.) Col. Sir Howard Vincent, in the course of his examination, said: I was before the Royal Commission upon Hospitals, and so

far as I saw, and I visited whenever I had the opportunity the various hospitals, their system was extraordinarily good, and the supplies were perfectly wonderful. The doctors repeatedly told me, in quite out of the way stations, that they had only to indent, and they received even the most rare medical comforts—port wine, Brand's jelly, and so on.

(Q. 5746.) Col. Sir Edward Ward, in the course of his examination, said: We gave the sick the best we could; but the sick rate increased so enormously that it was impossible to give them everything they wanted. The P.M.O. had to extend his medical comforts to the largest extent possible. He was always in consultation with me, and he had to alter his hospital diet according to what we were able to give him. We took all the spirits and all things likely to be useful for the sick into our possession before the siege (of Ladysmith) began, and locked them up, so that everything that could possibly be given to them they had.

(Q. 5748.) And the drugs and these things—were they still available? The medical officers, I know, were getting rather anxious about them. A certain amount of drugs were finished up, I believe. You see, we had very large numbers of sick. On one occasion—February 1 we had a proportion of 2,477 sick, taken out of 12,800 men; and in addition to that number there were many other men "attending hospital" who really in ordinary cases would have gone into hospital, but who would not go in because they were required for the defence, or who could not be spared. So that really even more than that number were receiving drugs. . . . The number gradually went down again. As General Buller's force approached us the sick rate went down, and as they retired it went up again. The decrease in the end was a good deal owing to that, I think. And it was, of course, the survival of the fittest. Any man who was really weakly had gone down by that time . . . .

(Q. 5786.) Just to put your opinion on record before you pass from that, what have you to say as to the medical comforts during that time? The medical comforts were sufficient in Bloemfontein—medical comforts, including fresh and condensed milk. . . . Gradually our opportunities of bringing up supplies increased, so that whenever the supplies began to come up a proportion of medical comforts came with them.

(Q. 5788.) But, during the period of stress, did you always have enough? Yes, quite enough. There were a large number of grocers' shops in Bloemfontein, and we were able to make up our medical comforts from them a good deal.

(Q. 5803.) . . . . We found out, for instance, that if you put "port" or "brandy" on a case, that case sometimes did not get up

to its destination; therefore we altered it. It was better to keep it anonymous.

Field-Marshal the Rt. Hon. Viscount Wolseley, in the course of his examination, said:

(Q. 9187.) With regard to the medical service have you anything to say? I think the same thing ought to hold good of the medical profession as regards selection. (For all grades of officers the more you can introduce selection into your system of promotion the better.) I think they have always done their work remarkably well. Perhaps in some cases the heads of the Medical Department are a little too old—that is the only criticism I would pass upon them; but taking them all round, I think the Medical Department are a most devoted body of officers.

(Q. 9188.) And the service did well in the war? So far as I know they have done very well indeed.

Correspondence.

DUM-DUM FEVER? KALA AZAR? NON-MALARIAL REMITTENT FEVER.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—As I was responsible for the application of the name "Dum-Dum fever" to the disease in which I first found the new parasitic bodies, may I trespass shortly on your space, in reply to the letter of Col. Crombie in your last issue?

Col. Crombie takes exception to this designation as being too narrow, and, from this point of view, quite rightly, but I would point out that I have by no means suggested or intended that this name of "Dum-Dum fever" should be permanently adopted, but that I only employed it, *faute de mieux*, as a temporary "specification ticket," with which to label what appeared to me, at that time, to be a disease *sui generis*. In the remarks appended to the case published by Major Mathias I alluded to the extending geographical range of the cases in which the presence of the parasite had been reported, and, also, to the clinical analogy between these cases and kala-azar, and it seems to me that, if further investigation proves these parasites to be the cause of the well-known kala-azar, as appears probable, there will then be no need for a new name, and the merely temporary one of "Dum-Dum fever" will naturally merge in that of the older and better known disease, with which it will have been proved to be identical.

With regard to Col. Crombie's suggestion, that the term "non-malarial remittent fever" should be employed for the cases in which these parasites are found, I cannot help thinking that this would be a retrograde step. The fever in question, undoubtedly, comes clinically under such a designation, but I am sure that Col. Crombie, with his wide experience of Indian fevers, would be the last to suggest that every case of non-malarial remittent fever was one of kala-azar, or one in which the new parasites were likely to be met with. The name proposed by him is perfectly accurate as far as it goes, *but* it does not go far enough; in other words, while it might *include* all the cases in which the parasite was found it would not, by its terms, *exclude* other cases of non-malarial remittent fever, some of which, undoubtedly, differ widely in symptomatology, course and mortality from those in which the presence of the parasites has so far been demonstrated, and the causative agent in their case is still to seek.

The questions as to the nature and significance of these bodies being at present in a somewhat inchoate condition, I would deprecate anything in the nature of a dogmatic name or definition being applied to the morbid conditions in which they occur, as it is far from unlikely that, in the light of further experience, such name or definition would need to be once more altered or revised.

I am, &c.,
W. B. LEISHMAN,
Major R.A.M.C.

Blairmore, N.B.,
April 11, 1904.

Reviews.

Lessons of the late War, from a German Standpoint.

No claim is made for originality in this paper; it is but a summarised translation of certain articles on the lessons of the Boer War, by General-Oberarzt Niedergall (*Militär-wochenblatt*, Nos. 17 and 20, 1903), and Oberstabsarzt Leopold (*ibid.*, No. 26, 1903), which it has occurred to me might not be without interest to my brother officers. I have not ventured to indulge in many comments, leaving this task to those whose experience in the late war gives them greater authority to do so.

The first-noted paper commences with a brief description of the actions of Magersfontein, Colenso, and Spion Kop, which it is unnecessary to repeat. The author deduces from these actions that in future the duration of the attack will be much longer, and that the forward movement may often come to a standstill, even for hours, while the superiority of fire, necessary to a fresh advance, is being attained. He then goes on to say that in all stages of the attack there will be a loud call for surgical assistance, especially during lulls in the firing, and these demands will begin while the attack is still a long distance from the enemy. Considerations of humanity, not to speak of the mere effect produced on their comrades, will not permit of the wounded being left in the long-drawn torture of their wounds till such time as the medical units can come to their assistance in perfect safety. In most cases such assistance would come too late. If the medical services are to afford the assistance which their comrades expect from them, they must not keep themselves out of the enemy's fire, but must, above all, be present on the spot where such assistance can be of use. Their sphere of activity is the same as that of the troops, and the two must work together. No doubt under modern conditions of fire the task put before the medical corps has become harder; nevertheless, it is its duty to show itself equal to these higher demands, provided, of course, that the conditions are such that this can be done without useless expenditure of men whose special knowledge makes them at once indispensable and irreplaceable during an action. It must be remembered that every unnecessary casualty in the medical corps recoils on the troops, who find themselves robbed of their assistance. At the same time, the point comes up for decision whether, in view of the greater amount of work thrown on dressing stations by the introduction of modern weapons, it may not be necessary to increase the number of medical officers at present allowed for bearer companies, apart altogether from those lent to them from field hospitals, and thus to avoid detaining regimental medical officers, who are, as a rule, attached to main dressing stations, away from their units. It must be remembered that as long as they are so detained their services are lost to their own units, which probably earnestly desire them, while in the

incessant coming and going their return to those units may be even further delayed.

When, however, as under present fire conditions must generally be the case, the bearer company will only come into action when the combat has already entered on a more or less permanent phase, it is worth considering whether under certain circumstances, *e.g.*, the proximity of suitable buildings, it might not be as well to dispense entirely with the formation of a main dressing station, and to make use of the waggons and stretchers of the bearer company to transfer the wounded direct from the regimental dressing station to the field hospital. Now-a-days there need be no hesitation in pushing a field hospital so far forward; on the other hand, this plan presents great advantages from the point of view of the wounded, lessening as it does the changes from regimental station to dressing station, and from that to the field hospital, by abolishing one of these posts. To work properly on these lines, field hospitals should be definitely told off to divisions. (In the German army, field hospitals are corps, not divisional units.) Even so far back as the Franco-German War, field hospitals were in most actions established on the field of battle, often pushed forward into houses just evacuated by the enemy; thus abolishing, or greatly reducing, the painful transport of the wounded. (At the battle of Gravelotte, four field hospitals of the 8th Army Corps were established in the village of that name by 3 p.m. on the day of the action, one of those even pushing forward to St. Hubert.)

In consideration of the increased number of wounded to be expected in future engagements, arrangements should be made for increasing the wheeled transport at the disposal of the bearer company, by procuring supplementary waggons, *e.g.*, forage carts. The twenty-four ambulance waggons of the three bearer companies, even when supplemented by the six four-horse store waggons of the field hospital (supposing these to be available), will not be nearly sufficient to meet the great demands of wheeled carriage. An increase in the number of regular ambulance waggons is inadmissible on tactical grounds; we must therefore in the future depend on auxiliary transport. How difficult this may be to procure, even in a well-inhabited country, was shown in the Austrian War of 1866, when the field of Königgrätz was not cleared till the evening of July 5. Even in a rich agricultural country like France, much difficulty was found in procuring carts, as, for instance, after Gravelotte.

There is one more point of importance the experience of the South African War has shown: it is that, with the new hard-mantled bullet, wounds which are limited to the soft parts, even if inflicted at short range, heal with great rapidity. It may be taken for granted that the slightly wounded will amount to one-half of the total number of wounded. It will be an important duty of the medical corps to see that this substantial number of men (amounting in an army corps of 80,000 strong with a 20 per cent. casualty list to 3,000) should be removed to a position of safety as rapidly as possible, since it is obviously to the enemy's interest to capture all such cases as might otherwise be fit for action again at an early date. The selection of

a post of assembly for slightly wounded is therefore an important tactical question, and this post must also be provided with rapid means of removal to the rear. In case of retreat, this post must receive early notice of the move and full instructions. The author summarises his conclusions, of which the following are the more important:—

The medical service must adapt itself to the new conditions, and above all be available when and where it is needed. If its assistance is not to be too late, then its sphere of activity must be on, not behind, the battlefield.

The medical establishments of fighting units must do their work in the nearest available cover behind the fighting line that they can find. They can only venture into the actual fighting during lulls; while fighting is actually going on they should be held back.

The regimental dressing station party must push up as close as the nature of the ground permits, so as to be able to give their assistance during lulls in the fighting. The establishment actually accompanying the corps unit is insufficient for all that may have to be done.

Since without cover it will be impossible for the medical service in the field to be carried out, it is important that medical officers should be carefully trained in peace time in the rapid selection of suitable positions for dressing stations. At the same time the general tactical situation must be considered.

It will be necessary to increase the establishment of the regimental dressing stations.

This will be best effected by doing away with a special combat medical establishment, *i.e.*, that portion of the corps unit medical establishment which actually follows a unit into action (usually half the medical officers and the company stretcher bearers), which is superfluous in view of the fact that the regimental dressing station will be pushed as close to the actual scene of fighting as possible.

This can be further effected by sending the bearers of the bearer company on to the field without pitching a main dressing station, or else by removing them altogether from the bearer company and forming them into special stretcher squads.

The medical establishment of the bearer company should be kept as close up as possible with a view to the early erection of a main dressing station immediately an opportunity offers.

In view of the fact that we may expect an increase in the number of wounded and a consequent great increase of work at the main dressing station, the medical establishment of bearer company should be increased, which would at the same time permit of the corps unit medical officers who may have been put on duty at this station rejoining their units more expeditiously.

The second paper under notice is not of such practical value, perhaps, as that already summarised. It is chiefly occupied in combating too optimistic a spirit with regard to the amount of work that can be carried out in the field during an engagement. The following sentences give the gist of the author's thesis: "Any practical assistance on the part of the medical services in the immediate rear of the fighting line must, for fairly obvious reasons, remain a mere pious aspiration.

Not much bandaging and dressing can be done by a man who has to be grovelling and crawling on the ground, and to send medical officers and bearers out to troops lying behind scanty cover would be to make them mere wandering targets, a thing no sensible commander would allow."

Referring to the paragraph in the German Field Medical Regulations which lays down that the regimental medical establishment is to be split into two parts, one of which is to follow immediately behind the troops in action, Leopold hopes that this will be left out of the expected new edition of the Regulations. This view is also that adopted by General Arzt Timann in his "Medical Services in the Field of Battle." As a substitute for medical assistance, Leopold recommends that as many officers, non-commissioned officers and men as possible, but especially officers, should be instructed in first aid. The principles of aseptic and antiseptic surgery must be fully explained to them. Otherwise dressing by laymen is apt to do more harm than good. An immediate dressing is not, however, in all cases an absolute necessity. In the words of von Bergmann, "I do not consider it essential that a wound should be dressed. A dressing which is applied in a hurry and without aseptic or antiseptic precautions does more harm than good. The first dressing should be applied only when and where it can be properly applied. This means, in other words, at the main dressing station." Leopold also discusses the question as to the proper moment for pitching the main dressing station, and is strongly of opinion that this is habitually done too early on manœuvres, especially by junior medical officers. He points out the great inconvenience that may be caused, either in the case of advance or retreat, if so cumbrous a unit has to be broken up and moved forward, or perhaps allowed to fall into the hands of the enemy.

With regard to the remarks made by Leopold as to the possibility of work close to the fighting line, I think the position he takes up is too pessimistic. Even in South Africa, where the attack was so often carried out over an open plain, medical officers managed to stay by and work with their regiments, and in more broken ground, at least as much, if not more, could be done. I think Niedergall's opinions on this point must be taken as the soundest. A point of interest is the question raised by Niedergall of the occasional elimination of the main dressing station in an action. If this were to become a rule, then the logical sequence would be to abolish the bearer company as a separate unit and combine it with a field hospital as is done in India, and in the Austrian army to a certain extent. In fact, Niedergall seems to contemplate something of the kind, since he advocates the separation of the bearers from the bearer company (*Sanitats Kompagnie*) and their formation into a special stretcher company (*Kranken trager-Kompagnie*). It is obvious that if you take away the bearers, and omit to pitch the main dressing station, the *raison d'être* of the *Sanitats Kompagnie* is rather vague. I understand that the experience of the late war was in favour of some such union between the bearer company and the field hospital.

C. H. Melville.

An English Handbook to the Paris Medical School. By A. A. Warden, M.D. J. and A. Churchill, 2s. net, 1903.

To a medical man visiting Paris for the first time, with a view to attending any of the numerous and excellent cliniques there, this handbook must prove invaluable. After some introductory remarks, the author proceeds to give a complete list of the numerous hospitals in Paris, the means of getting to them, the names of the staff of each, the hours of attendance, and the subject taught by each professor; in short, all the information which a stranger requires. The daily diary at the end of the book will also be found of the greatest assistance in mapping out the day's work. If we may be permitted to make a suggestion it is that the section on "General Information," which is at present at the end of the volume, would be better placed at the beginning. A map of Paris showing the omnibus and tram lines from the Palais Royal to each hospital would make the work practically perfect. Lord Lister has expressed his approval of this work, which should be sufficient guarantee as to its value.

C. E. Pollock.

The Anti-Malaria Measures at Ismailia. By Rubert Boyce, M.B., F.R.S., Liverpool School of Tropical Medicine. Longmans, Green and Co., 1904.

In this pamphlet Dr. Boyce describes the results of anti-malarial methods undertaken at Ismailia in the year 1902. In September of that year Major Ronald Ross went to Ismailia in order to give the Suez Company advice in regard to methods of prevention of malaria in that town. Major Ross made a careful examination of all possible breeding places, and he suggested a plan of campaign. His recommendations have been carried out with great success. Mosquitoes are now rare, and the number of malaria cases has been reduced from 2,284 in 1900, to 209 in 1903, in a poulation of 9,000, and no deaths from malaria are recorded for the first time in 1903 among the Europeans.

Of course the Canal Company is the controlling force everywhere in Ismailia, and the success of this experiment no doubt is greatly due to their having themselves carried out the work, and having been helped by the residents, who are their employés.

Major Ross's plan of campaign was to form two anti-mosquito brigades—one, the "Drains Brigade," composed of five natives and one European in charge, whose duty it was to keep all drains clear; the other, the "Petroleum Brigade," consisted of four natives in charge of a European, was told off to add petroleum to all collections of water which could not be removed at once. In addition to forming these brigades, the company undertook extensive drain-clearing operations and the filling in of a considerable area of waste marsh-land with sand. Once a week the "Petroleum Brigade" visits the houses and pours a mixture consisting of equal parts of crude and ordinary petroleum into all collections of drains and waste water which do not soak away during the course of the day. Petroleum is poured into the water closets

and into the pits or wells for the reception of bath or slop water. The garden fountain is emptied, and if any water still remains in it which cannot be removed petroleum is added. It is again filled after twelve hours. Similarly, the stable drains, washing troughs, and all receptacles containing waste water are flushed or emptied, or petroleum added. The essence of the procedure being to either empty and cleanse and then renew all water receptacles, or to add petroleum when this cannot be done. The Company had found that it is absolutely necessary to have at the head of these Brigades Europeans. The work must not be left to the native alone. The following table gives the malarial statistics of Ismailia :—

STATISTIQUE DU PALUDISME À ISMAILIA.

Mois	1897	1898	1899	1900	1901	1902	1903	1904
Janvier ..	83	94	201	156	128	162	13	
Février ..	103	83	165	139	83	105	20	
Mars ...	129	126	129	266	99	101	16	
Avril ..	135	127	109	175	100	64	14	
Mai	173	77	126	169	82	133	9	
Juin	180	43	126	114	68	154	15	
Juillet ..	188	81	104	145	74	120	23	
Août.. ..	242	86	107	166	123	130	19	
Septembre ..	336	128	128	258	244	176	25	
Octobre ..	254	178	172	228	372	159	39	
Novembre ..	178	271	209	244	352	174*	12	
Decembre ..	88	251	209	182	265	73	4	
	2,089	1,545	1,784	2,284	1,990	1,551	209	

* Operations begun.

The cost of these operations is given by Dr. Boyce. For filling in marsh-land and cleaning out drains the Company has spent £4,400. The "Drain Brigade" costs £200 a year, and the "Petroleum Brigade" £520.

D. BRUCE.

Current Literature.

The Action of Yeast on Boils.—In a reprint from the *Annales de l'Institut Pasteur* (vol. xvii., October, 1903) M. Edmond Sergent reports a series of experiments in which he investigated the action of yeast on suppurative cutaneous processes. Confirmation was obtained of the fact already observed clinically, that yeast when administered internally has a favourable action on small suppurative foci, such as furuncles; though it is useless in extensive abscess formation. Idiosyncrasy also plays a part, and in some persons furunculosis is entirely uninfluenced by yeast. The writer's experiments were carried out on white or black rabbits, the skin of which is susceptible to infection with the staphylococcus.

The fur over a small area was shaved or epilated, and a few drops of a broth culture of *Staphylococcus aureus* was rubbed in with a sterile lifter, until the epidermis was slightly excoriated. Two days later 40 to 100 pustules of the size of a pin's head appeared. On the third day the pustules were larger, and surrounded by a red areola. On the fourth day they began to dry up, and on the fifth or sixth day desquamation was complete. If 20 to 30 c.c. of a thick emulsion of yeast were injected down the throat of a rabbit as soon as the pustules appeared on the second day, and the dose was repeated on subsequent days, the suppurative process was shortened. The pustules began to dry up on the third day, and the scabs fell off on the fourth. If yeast were given as a prophylactic twenty-four hours before the inunction of staphylococci, the results were still more striking: only a few scattered vesicles, which dried up in a few hours, appeared. The action of yeast is evanescent. If it is given for a week or a fortnight, but the treatment is suspended for twenty-four hours before inoculation, an unmodified eruption results. Administration of yeast *per os* is the only practicable method. Intravenous inoculations are followed by sudden death, and subcutaneous or intraperitoneal injections are not absorbed. In the writer's experiments yeast, when introduced hypodermically, gave rise to nodular tumours, which enlarged indefinitely. They contained a caseous material. The serum of animals affected with these tumours agglutinated cultures of the staphylococcus, but had no bactericidal action. The active principle of yeast is readily extracted. The yeast cells are killed by being placed for twenty-four hours in absolute alcohol, the alcohol is removed by filtration, and the yeast is dried between folds of sterile paper at 37° C. The dried yeast is then macerated for two days in sterilised tap-water. The water is strained and passed through a Chamberland filter. The filtrate is lemon-coloured with a vegetable odour and taste. If this extract is given to rabbits in doses of 50 to 80 c.c., the results resemble those obtained by unaltered yeast. It has also been administered to persons suffering from furunculosis, with results equal to those obtained with brewers' yeast. The first effect is subsidence of pain, enlarged lymphatic glands diminish, already ruptured furuncles rapidly heal, and those in the inflammatory stage abort, leaving only slight redness and tenderness, which persists

for some days. The possibility that living yeast cells may be injurious, and San Felice produced malignant tumours by yeast obtained from the skin of edible fruits, indicates the superiority of the sterilised extract.

C. P. HANDSON.

Anopheles in Non-malarial Districts.—According to MM. Edmond and Etienne Sergent (reprint from *Comptes rendus des séances de la Soc. de Biologie*, vol. lv., p. 1357), the *Anopheles maculipennis*, which is found in the suburbs of Paris, is identical with that of the department Vendée. Malaria is rife in the latter region, but not in the former. Schandinn and Celli explain similar observations by supposing that the Anopheles of non-malarial countries have become immune to the malarial parasite. However this may be, the habits of the Parisian Anopheles differ from those of the Vendée animal. In the suburbs of Paris they are seldom found in houses which are close to the lairs of their larvæ. But in La Vendée Anopheles are commonly found in houses, and in numbers proportional to the neighbouring breeding places. Possibly this difference in habits is connected with a difference of mean temperature, which is higher in La Vendée than in Paris.

C. P. HANDSON.

Ricinus and Papaw Plants as Deterrents to Mosquitoes.—In the JOURNAL OF TROPICAL MEDICINE (July 15, 1903), Percy Groom stated that a house surrounded by papaw plants (*Carica papaya*) remained free from mosquitoes, though others in the same neighbourhood were infested. A similar deterrent action is commonly attributed to castor-oil plants (*Ricinus communis*) in Algeria and Egypt. To test this reputed action, MM. Edmond and Etienne Sergent (*Comptes rendus des séances de la Soc. de Biologie*, 1903, p. 1357) placed a papaw plant in the middle of a mosquito net of oblong shape in such a way that mosquitoes would be compelled to pass it in travelling from one end to the other. At the end of the net nearest the window were placed a dish of water and a raisin, of which mosquitoes eat greedily. At the opposite end were introduced four female *Anopheles maculipennis* and four female *Culex pipiens*. After four minutes one Anopheles and one Culex had traversed the entire length of the net; at the end of ten minutes an Anopheles and a Culex were resting on the leaves of the papaw. The insects were confined in the net for a week. One Anopheles and one Culex died. In a similar cage, in which there was no papaya, six of twenty Anopheles, and nine of thirty-eight Culices died. Exactly similar results were obtained with the ricinus plant. Thus neither the papaya nor the ricinus have any influence on mosquitoes. In Algeria the writer's observation has led him to conclude that the ricinus actually attracts mosquitoes. Thus a pool in which Anopheles larvæ swarmed was overshadowed by several large clumps of ricinus. At Alma the station-master's room was infested with mosquitoes, although an enormous ricinus stood immediately outside the window. The Eucalyptus plant has also been credited with being inimical to mosquitoes. But the station of Ouled-Rahmoun, which was formerly infested with mosquitoes, has been comparatively immune since the surrounding belt of

large Eucalyptus trees have been cut down; and at Ighzer-Amokran the native workmen never lie under the shade of the neighbouring Eucalyptus wood, because it is swarming with mosquitoes. But if these trees are not beneficial they are harmful, as they afford a shelter for mosquitoes during the day.

C. P. HANDSON.

The Care of Teeth in the Army.—This subject is discussed at some length by Staff-Surg. Richter, a dentist of Chemnitz, in the January number of the *Deutsche Militärärztliche Zeitschrift.* In accordance with a recent order of the Prussian War Minister, it is the duty of a sanitary officer to instruct subordinates as to the importance of attention to the mouth and teeth. Detailed instructions on this subject had previously been issued by the Saxon authorities.

After glancing at the branches of dentistry in general, Richter states that for military purposes the topics for discussion are: (1) The extraction of teeth; (2) the stopping, and (3) their replacement by substitutes. He goes on to describe the various faulty shapes of the jaws and the effects on the teeth. He next describes the method of examining the teeth and gums, and lays great stress upon the mischievous results of accumulations of tartar. Caries is next described, several pages being devoted to an account of its origin, effects and treatment, and emphasis being laid upon the importance of the early removal of decayed roots and useless teeth. Artificial substitutes are next discussed.

Richter then describes the hygiene of the mouth and teeth. The latter should be well cleansed with a brush every night before going to bed, so as to remove all fragments of food. A second cleansing in the morning is less important; the teeth will be cleansed by the work imposed upon them at breakfast. If the careful use of the brush causes bleeding, accumulation of tartar is the probable cause. This should be removed by a dentist, if the use of a brush and toothpick prove insufficient. Tooth-brushes should be kept soft and straight; the bristles not closely set.

The use of tooth-powder, soap and mouth-washes is disapproved of by Richter. The powder is apt to cover up small gaps and notches in such a way that such spots are not cleansed. The mouth-washes do not destroy micro-organisms. Careful mechanical cleansing is far more efficacious than any chemical disinfectant. Other effects of bad teeth are next mentioned, such as disorders of digestion, owing to insufficient mastication. The remedy is the application of a frame, fitted with artificial teeth. Preliminary measures are, of course, requisite. The frame and teeth must be removed at night, and placed in a cup of water, and kept very clean.

In order to discover the frequency of dental diseases among soldiers, Richter examined 1,000 men of a Saxon Regiment in Leipsic. Only 61 had perfectly good teeth; among the others there was an average of 1·4 teeth wanting, and 4·5 decayed. Of the latter, 2·1 could be stopped, while 2·3 required extraction. He was informed that in one Infantry regiment there were yearly about 2,100 stoppings, 2,300 extractions, and 50 sets of artificial teeth supplied. Arrangements have been made in Bavaria and Saxony for teeth to be stopped at the small cost

of 0·10 mark, while a frame with about eight teeth can be supplied for 7 marks.

Koch's Treatment of Malaria.—In the *Bulletin de l'Institut Pasteur*, tome i., No. 11, M. Edmond Sergent reviews the articles on this subject by Koch and his pupils, which appear in the *Zeitschr. f. Hyg.*, Bd. xliii., Fasc. 1, pp. 1 to 238. Every case of malaria in a district can be discovered by systematic examination of the blood of the inhabitants, and especially of the children, who are more liable to malaria than adults. Only by this means can cases of latent malaria, which through the intermediacy of the Anopheles are foci of infection, be discovered and treated. Once diagnosed, every case—whether of latent or obvious malaria—is treated by a prolonged administration of quinine, which prevents sporulation of the parasite and infection of the *Anopheles*. The old method of prophylaxis by quinine was to give the drug to healthy and infected alike in the hope of preventing infection or relapses. Koch's method differs essentially, as he gives quinine only to those who harbour the parasite. The treatment should be continued for months, quinine being given on two consecutive days every eighth or ninth day. Clinical examination of the patients is unnecessary; the microscope indicates the need for treatment in each case. The method has been tried in Istria, Italy, in the German colonies in Africa, and at Wilhelmshaven.

Brioni, where experiments were made by P. Frosch, under Koch's instructions, is a small island of about 300 inhabitants off the coast of Istria, which is covered with a sub-tropical vegetation and contains numerous pools and cisterns swarming with the larval Anopheles. After December, 1900, a specimen of the blood of everyone on the island was prepared weekly, and sent for examination to the Berlin Institute. The result was communicated telegraphically in the positive cases, and by letter in the negative. Every person who harboured the malarial parasite was at once treated by quinine. In 1901 a rule was made and enforced by the proprietor of the island that everyone who refused to have his blood examined monthly should be expelled, and additional examinations were made as the state of health of any person seemed to require. Everyone who left the island was subjected to re-examination on his return. All infected persons were treated with 15 grs. of quinine on two consecutive days. If an attack occurred, or if the blood contained small or large annular parasites, 30 grs. were given for two consecutive days, and 15 grs. on the three following days. Afterwards 15 grs. were given on two consecutive days, every ninth day in tertian, and every eighth day in quotidian ague.

The results for the first year, 1901, were that 17 fresh cases of malaria and 3 relapses occurred. During 1900 there had been about 97 fresh cases with the same number of inhabitants. In 1902 the same measures were enforced. In addition 170 healthy workmen were imported experimentally. Not one of these became infected, and, though a few relapses occurred, there was not a single fresh case of infection on the island. Similar success attended the method at several places on the Istrian coast opposite Brioni. Formerly a stay of a single night on the island was sufficient for malarial infection to be contracted.

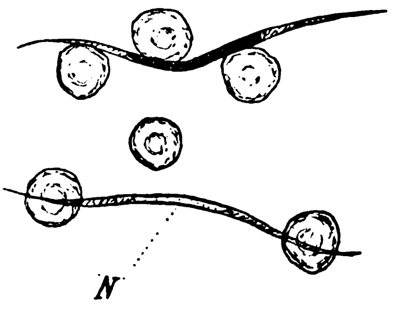
The efficacy of the method was also demonstrated by Vagedes in German South-west Africa. In Franzfontein, a village of 279 inhabitants, 56 per cent. harboured the malarial parasite. Three-quarters of the 170 who were permanently resident were malarious. The year after the treatment was begun only 6 per cent. of the total and 9 per cent. of the permanent inhabitants were affected. Good results were obtained by Ollwig in Dar-es-Salam.

In the Tuscan Marshes fifteen medical men were occupied during 1901 in examining blood and administering quinine. The results are reported by Gosio. In 1900 the mean morbidity was 55·88 per cent. In 1901 it had fallen to 24·53 per cent., which represented an improvement of 31·35 per cent. In 1899 the inhabitants of neither Alberese nor Deposito were treated by quinine. In 1901 those of Deposito were treated, but those of Alberese were not. In 1899 there were 7 fresh cases of infection in Alberese; in 1901 there were 81 cases. But in Deposito the figures were reversed, there being 80 cases in 1899, and only 18 in 1901. Gosio compares the relative value of prophylaxis against malaria by mechanical means only, by mechanical means combined with the administration of quinine, and by quinine alone, and gives tables which show that with the first method 44·11 per cent., with the second 16·29 per cent., and with the third only 13·57 per cent. of the inhabitants became infected. If no prophylaxis whatever is enforced, 84·18 per cent. succumb to infection. He found that four months of treatment were not always sufficient to effect a cure, and recommended a prolongation of the treatment. It appears from the results obtained in 1902 that the effects of treatment during one year are traceable in the next, so that it is unnecessary to renew the campaign every season. Martini's results at Wilhelmshaven are also confirmatory.

C. P. HANDSON.

A New Protozoal Parasite found in Human Blood.—(Extract des *Comptes rendus des séances de la Société de Biologie Séance*, October 17, 1903, tome lv., p. 1163.) MM. Edmond and Etienne Sergent, while engaged in an anti-malarial campaign on the Eastern Algerian Railway, found in the blood of a young native a curious ectoglobular parasite, differing widely from any of those at present known. The man in whom they were found was a healthy employé of the Railway, aged 28, who had never quitted Algeria; except for malaria in his early boyhood he had enjoyed good health. The appearance of the parasites in the blood presented a marked periodicity, and the symptoms, though very slight, and not affecting his general health to any appreciable degree, recurred in the same form daily. Though normally a sound sleeper, he awoke every night about 11 p.m. in a profuse cold sweat, occasionally accompanied by nausea, and remained awake for an hour, after which he slept again, and next morning, beyond some somnolency, felt quite well again. The parasites appeared regularly in the blood about 8 a.m., and were to be found there until about 6 p.m., when they completely disappeared until the following morning; in number they attained a maximum of twenty-five in an ordinary film preparation.

MM. Sergent were unable to observe the parasites in fresh preparations, owing, they think, to their hyaline nature and lack of motility, and their observations were made entirely upon stained preparations. Ordinary stains, such as fuchsin, thionin and hæmatein, were unsatisfactory; and their best results were obtained from an eosin azure-blue mixture (a modification of Romanowsky). When stained in this way the parasites appeared as long, flat, vermiform bodies, 36 to 45 μ in length and 1 to 1·5 μ in maximum breadth; both extremities were filiform, the body commencing to taper gradually at a point 7 to 8 μ from either extremity. They showed only slight curvatures from the main axis, and possessed no trace of a flagellum or of any other appendage. The



middle third was occupied by a body showing some differentiation of staining from the rest of the parasite, which MM. Sergent consider to be of the nature of a nucleus. In some cases this nucleus was stained darker than the rest of the parasite, in others lighter; the latter body being the more definitely granular of the two. The general health of the man appeared to be quite unaffected by the presence of these parasites in his blood, and he presented no other symptoms than those mentioned. No similar case had been observed by the authors or their colleagues in Algeria during the last twenty-five years.

Although MM. Sergent expressly state that these parasites are certainly not of the nature of trypanosomata, it is hard to banish such a conjecture from one's mind, especially in view of the great pleomorphism of these organisms, and of the recent startling work of Schaudinn in connection with the evolution of *Trypanosoma noctuæ* (*Arbeiten aus dem Kaiserlichen Gesundheitsamte*, vol. xx., Part 3, 1904).

W. B. Leishman.

Corps News.

Royal Army Medical Corps.

Lieut.-Col. G. T. Trewman, M.B., is placed on temporary half-pay on account of ill-health, dated March 17, 1904.

Lieut. J. Waddell is placed on temporary half-pay on account of ill-health, dated March 11, 1904.

Lieut.-Col. G. A. Hughes, M.B., D.S.O., to be Col., *vice* R. de la C. Corbett, M.D., D.S.O., deceased, dated March 25, 1904.

Lieut. J. H. R. Winder, M.D., to be Capt., dated February 27, 1904.

Lieut.-Col. R. C. K. Laffan retires on retired pay, dated April 16, 1904.

Memorandum.

Major A. Pearse has been granted leave from March 8, 1904, to March 16, 1905, on completion of a tour of service on the West Coast of Africa.

Army Medical Reserve of Officers.

Surg.-Major J. G. Saville to be Surg.-Lieut.-Col., dated March 15, 1904.

Surg.-Major F. H. Appleby to be Surg.-Lieut.-Col., dated March 15, 1904.

Surg.-Lieut. C. W. Marshall, M.B., 1st Volunteer Battalion, Princess Louise's (Argyll and Sutherland Highlanders), to be Surg.-Capt., dated March 26, 1904.

Surg.-Capt. G. A. Lang, M.B., having resigned his Commission in the Volunteers, ceases to belong to the Army Medical Reserve of Officers.

Volunteer Corps.

The Highland Royal Garrison Artillery.— Surg.-Capt. G. A. Lang, M.B., resigns his Commission, dated March 19, 1904.

3rd Middlesex Royal Garrison Artillery.— Surg.-Capt. P. Wood resigns his Commission, dated March 19, 1904.

1st Suffolk and Harwich Royal Garrison Artillery.—Surg.-Lieut. A. Y. Pringle to be Surg.-Capt., dated March 19, 1904.

2nd Volunteer Battalion the Duke of Cambridge's Own (Middlesex Regiment).—George Walker Thomas Clarke, Gent., to be Surg.-Lieut., dated March 19, 1904.

4th Volunteer Battalion the Cameronians (Scottish Rifles).—Brig. Surg.-Lieut.-Col. J. Macfie, M.D., Senior Medical Officer, Scottish Rifle Volunteer Infantry Brigade, resigns his Commission, and is granted the honorary rank of Surg.-Col., with permission to wear the prescribed uniform, dated March 26, 1904.

1st Volunteer Battalion the Duke of Wellington's (West Riding Regiment).—Alfred Thomas Griffiths, Gent., to be Surg.-Lieut., dated March 26, 1904.

2nd Volunteer Battalion the Hampshire Regiment.—Surg.-Lieut.-Col. R. T. Cæsar resigns his Commission, and is granted the honorary rank of Surg.-Col., with permission to wear the prescribed uniform, dated March 26, 1904.

3rd London.—Surg.-Lieut. T. W. Parry, M.B., to be Surg.-Capt., dated March 26, 1904.

2nd (Renfrewshire) Volunteer Battalion Princess Louise's (Argyll and Sutherland Highlanders).—Surg.-Capt. H. C. Donald, M.B., to be Surg.-Major, dated March 26, 1904.

7th Lancashire Royal Garrison Artillery.—The appointment of Joseph Grant-Johnston, Gent., to a Surg.-Lieutenancy, which was announced in the *London Gazette* of February 19, 1904, is cancelled.

8th Volunteer Battalion the Royal Scots (Lothian Regiment).—Robert Cross, Gent., to be Surg.-Lieut., dated April 2, 1904.

1st Volunteer Battalion the Royal Warwickshire Regiment.—Cyril Henry Howkins, Gent., to be Surg.-Lieut., dated April 2, 1904.

2nd Volunteer Battalion the King's (Liverpool Regiment).—Capt. D. Smart, M.B., from the Liverpool Volunteer Infantry Brigade Bearer Company, to be Surg.-Lieut., and to be borne as Supernumerary whilst doing duty with the above Bearer Company, dated April 2, 1904.

Lieut. J. G. Martin, M.B., from the Liverpool Volunteer Infantry Brigade Bearer

Company, to be Surg.-Lieut., and to be borne as Supernumerary whilst doing duty with the above Bearer Company, dated April 2, 1904.

Cadet Corps (Uppingham School) attached to 1st Volunteer Battalion the Leicestershire Regiment.—Harry Lyon Smith, Gent., to be Acting Surg., dated April 2, 1904.

Cadet Corps (Civil Service) attached to the Prince of Wales's Own 12th Middlesex (Civil Service).—Robert Welsh Branthwaite, Gent., to be Acting Surg., dated April 2, 1904.

2nd Volunteer Battalion the Durham Light Infantry.—Surg.-Lieut. T. H. Livingstone, M.B., resigns his Commission, dated April 2, 1904.

9th Lanarkshire.—Surg.-Lieut. W. J. Mackinnon, M.B., to be Surg.-Capt., dated April 2, 1904.

VOLUNTEER INFANTRY BRIGADE BEARER COMPANY.

West Yorkshire.—Supernumerary Surg.-Capt. G. G. Oakley (Honorary Capt. in the Army), from the 1st Volunteer Battalion the Duke of Wellington's (West Riding Regiment), to be Capt. and to Command, dated March 26, 1904.

ROYAL ARMY MEDICAL CORPS (VOLUNTEERS).

The Leeds Company.—Herbert John Robson, Gent., to be Lieut., dated March 19, 1904.

The Woolwich Companies.—Lieut. E. B. Dowsett resigns his Commission, dated March 19, 1904.

The Aberdeen Company.—The undermentioned Lieuts. to be Capts. :—

W. A. I. Fortescue, M.B., dated March 26, 1904 ; F. Kelly, M.D., dated March 26, 1904 ; A. Ogston, M.B., dated March 26, 1904 ; T. Fraser, M.B., dated March 26, 1904.

The Glasgow Companies.—Robert Yuill Anderson, Gent., to be Lieut., dated March 26, 1904.

IMPERIAL YEOMANRY.

Herts.—George Smith Ward, Gent., to be Surg.-Lieut., dated March 19, 1904.

The Duke of Lancaster's Own.—Harold Thorp, Gent., to be Surg.-Lieut., dated March 19, 1904.

ARRIVALS HOME.—From India: Lieut.-Cols. F. B. Maclean, J. T. Carly, A. O. Geoghegan and J. Carmichael ; Majors H. N. Thompson, D.S.O., S. N. Cardozo, A. P. H. Griffiths, S. Power, J. J. O'Donnell, H. E. Cree and J. C. Weir ; Capts. G. B. Carter, H. G. Martin, P. H. Collingwood, J. D. G. Macpherson.

ARRIVALS HOME ON LEAVE.—Lieut.-Col. R. P. Hetherington, Major N. Faichnie ; Capts. W. M. H. Spiller, J. P. J. Murphy, A. F. Weston, A. M. MacLaughlin, A. R. O'Flaherty, E. J. Dobbin, R. McK. Skinner, W. Riach and L. F. F. Winslow.

EMBARKATIONS.—India : Major A. J. Luther; Lieuts. A. E. B. Wood, R. L. V. Foster. Bermuda: Major J. J. C. Watson, C.I.E., and Capt. C. F. Wanhill. West Africa: Lieut.-Col. C. R. Bartlett; Capt. S. J. C. P. Perry. South Africa: Lieut. M. G. Winder.

POSTINGS.—Ireland: Major C. Dalton, Capts. P. H. Collingwood and H. G. Martin. South-Eastern District: Majors W. E. Hardy and H. E. Cree. Glasgow: Lieut.-Col. A. V. Lane. Canterbury: Lieut.-Col. F. B. Maclean. North-Western District: Lieut.-Col. A. O. Geoghegan and Major A. P. H. Griffiths. Southern District: Major S. N. Cardozo and Capt. J. D. G. Macpherson. Aldershot: Major H. N. Thompson, D.S.O., Major S. Powell, and Capt. G. B. Carter. North-Eastern District: Major J. J. O'Donnell. Home District: Major J. C. Weir.

CHANGES OF STATION.—Lieut.-Col. E. O. Wright, Devonport to Hounslow; Lieut. N. de E. Harvey, Curragh to Cork ; Lieut. G. S. Mackay, Netley to Bulford.

Major S. Powell has been selected to succeed Lieut.-Col. W. W. Pike, D.S.O., in the charge of the Military Families' Hospital at Aldershot.

Major J. C. Weir has been appointed Sanitary Officer in the Home District.

Capt. J. M. Buist has been appointed Clinical Pathologist at Woolwich.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE:—

Appointments: To be Staff-Nurses, Miss M. E. Richardson, posted to Royal Herbert Hospital, Woolwich; Miss L. M. Moor, posted to Royal Arsenal, Woolwich.

Promotions: To be Matron, dated March 19, 1904, Miss Caroline Hutton Potts.

Changes of Station:—

Matrons: Miss M. C. S. Knox, R.R.C., from Cambridge Hospital, Aldershot, to Western Heights, Dover; Miss G. E. Saunder, from Troopship "Plassy" to Portsmouth; Miss E. A. Tait, from Troopship "Plassy" to York.

Sisters: Miss E. C. Stewart, from Troopship "Plassy" to Cambridge Hospital, Aldershot.

Staff-Nurses: Miss E. M. Bickerdike, from the Troopship "Plassy" to Royal Herbert Hospital, Woolwich; Miss A. F. Byers, from Royal Herbert Hospital, Woolwich, to Royal Arsenal, Woolwich; Miss A. E. Fitzgerald, from Woolwich to Cambridge Hospital, Aldershot; Miss M. L. Harris, Portsmouth to Royal Herbert Hospital, Woolwich; Miss A. A. Wilson, Royal Arsenal, Woolwich, to Royal Herbert Hospital, Woolwich.

Resignations: Staff-Nurse Miss C. C. R. Moor has resigned her appointment, April 8, 1904.

The undermentioned Sisters and Staff-Nurses are confirmed in their appointments, their period of provisional service having expired:—

Sisters: Miss C. P. Gash and Miss E. M. Monck-Mason.

Staff-Nurses: Miss L. E. Mackay, Miss E. S. Mason and Miss M. Walker.

CASUALTIES, &c., from March 11 to April 10, inclusive.

Discharges.—"1st Period": Pte. J. Hudson; "1st Period": Pte. M. Clist; "Purchase": Pte. C. H. Cheetham; "Medically Unfit": Pte. E. McKeer; "Purchase": L. M. Jones.

To Army Reserve.—Ptes. J. McGunn, F. R. North, H. J. Otbie, H. Woods, W. Beer, T. Lawrence, A. F. Summersby, A. Jones, A. Adams, F. Smith, F. E. East, J. E. Hudson, W. Bryans.

Transfers to other Corps, &c.—Lce.-Sergt. R. E. Watson to H. L. I. Vol. Infty. B. B. Coy.; Lce.-Sergt. F. E. Trotter to Belfast Coy. R.A.M.C. Vols.; Sergt. R. T. Pack to Dublin Dist. Coy., R.A.M.C. Vols.; Pte. E. Thomas to A. S. Corps.

Embarkations.—To Ceylon, per ss. "Manila," March 5: Ptes. W. Evans, D. C. Evans, C. Browne.

Disembarkations.—From Egypt, &c., per ss. "Dunera," March 19: Sergt.-Major F. W. Norvill; 1st Cl. Staff-Sergt. A. W. Hands; 2nd Cl. Staff-Sergts. J. H. Halls, C. J. Strong; Sergts. W. Evans, A. E. Ford; Corpl. H. Bradley; Ptes. J. Bowmer, H. Welsh. From South Africa, per ss. "Avondale Castle," April 2: 1st Cl. Staff-Sergt. H. J. Ford; Ptes. J. F. Fitzgerald, Mc. J. O'Callaghan.

Deaths.—Ptes. E. F. Hawes, at Standerton, South Africa, February 27, enteric; W. C. B. Pank, South Africa, March 10, enteric; A. F. W. Robe, at Cork, March 23, pneumonia.

NOTES FROM DEVONPORT.—Capt. Kiddle writes: "A meeting of the Western District Medical Society was held at the Station Hospital, Devonport, on March 18, Col. Bourke, P.M.O., M.D., in the Chair; seven members were present.

"Major S. F. Clark, R.A.M.C., read a paper on "Hæmorrhage from the Bowel in Malaria." He said he had met with this complication in India, China, and at home. It occurred in persons who suffered frequently from malaria, and was characterised by the passage of large quantities of claret-coloured blood, with collapse and general symptoms of profuse hæmorrhage. Condition, though alarming, is amenable to treatment, *e.g.*, injections of quinine and ergotin with astringents. Ice-bags over abdomen.

"His theory of the pathology of the cases was that the malarial parasite altered the condition of the blood, enabling it to pass through the vessel walls of the intestinal mucous membrane.

"Captain Master, R.A.M.C., pointed out the similarity of these cases to some he had observed at Peshawur.

"Major Jevers, R.A.M.C. (retired), read a paper on a new method invented by him for the Cure of Riders' Sprain. He exhibited his apparatus, for which he claimed many advantages.

"Lieut.-Col. R. F. O'Brien has exchanged roster positions with Lieut.-Col. W. Dugdale, who has been warned for service in South Africa.

"Lieut.-Cols. L. E. Anderson and H. G. Hathaway have been selected for increased pay.

"Lieut.-Col. W. G. Macpherson, C.M.G., has been attached to the Japanese Army to report on the medical arrangements."

NOTES FROM IRELAND.—*Action against Messrs. Cook and Son.*—In the Green Street Court House, before the Recorder, Major Robert William Jackson, R.A.M.C., Eglinton, Sandymount, sued Messrs. Thomas Cook and Son, Tourist Agents, to recover damages, 19 guineas, for injury done to his property while in transit from Southampton to Dublin.

Mr. Smith (instructed by Mr. M. J. Jackson) appeared for the plaintiff, and Mr. T. H. R. Craig appeared for the defendants.

The plaintiff left his goods in charge of the defendant Company's servants at Southampton on his arrival from India, and they were subsequently sent across to Dublin by the British and Irish Steam Packet Co.'s vessel. When they were delivered to the plaintiff they were, as alleged, found to have been considerably damaged by water.

The defendants pleaded that they were merely forwarding agents, and not ordinary carriers, and that therefore they were not liable after they had placed the goods on board the steamer.

The Recorder said it was clear that Messrs. Cook were not liable. They were not carriers. He was sorry for Major Jackson, but the process should be dismissed, and he allowed 10 guineas costs.

NOTES FROM BANGALORE.—Lieut. Browne writes: "The following items may be of interest to the Corps: Major Lavie has left for Bellary; Major Raymond, Lieuts. Bell and Bridges have joined for duty.

"The Corps were "at home" on the first day of the Bangalore Spring Meeting. On the second day Capt. W. A. Ward's "Dolly" won the Trial Plate easily.

"It is rumoured that Capt. Cowie, R.A.M.C., intends to compete for the light-weight boxing championship of India (amateur).

"The Corps strongly represented Bangalore against Kolar in golf for the cup, Lieut. Bell especially distinguishing himself."

NOTES FROM BURMA.—Lieut.-Col. H. O. Trevor writes: "It will perhaps interest some officers of the Corps to learn that, with the sanction of the Lieut.-Gen. and P.M.O. of the District, the *Mess at Mandalay has been finally broken up. This was necessary as it is proposed in the future to locate only two companies of the British regiment at Mandalay,* the remainder to be at Maymyo. As it was considered unlikely that at any station in Burma in the future would the number of R.A.M.C. Officers be large enough to support a mess, the plate, crockery, trophies, &c., have been sent to the Mess at Bangalore. After defraying the cost of transferring these articles, a balance of £1 10s. remains, which with the sanction of the District P.M.O. is being sent for the benefit of the R.A.M.C. Benevolent Fund.

"It may also be of interest to add that Maymyo is now the Headquarters of the Burma District, and also the summer seat of Government. It is a plateau in the Shan States, 3,600 feet above sea-level, possessing a splendid climate and charming scenery. It is very salubrious except in the rainy season, and as the barracks, &c., are not yet completed, and the troops are mostly under canvas, it is probable that most of the men will return to Mandalay in May, this year. There are good possibilities of sport in the vicinity, and Maymyo should prove one of the favourite stations in the East; it is, however, at present an excessively expensive one to live in."

NOTES FROM RHODESIA.—Mr. Stanley Bruce writes: "I sent you by last mail a copy of Progress Report by Koch on Horse Sickness, and I think he looks like getting a preventative. Up to the present his inoculation for African Coast Fever has not been very satisfactory. The number of inoculations does not appear to be sufficient to fortify animals against gross infection, and he now recommends an increased number of inoculations. He leaves this country at the end of next month for Germany.

"The imported camels have been giving me a lot of trouble. About four months ago foot and mouth disease broke out among them, and on the whole they are not doing well. I do not think that they are likely to be very useful here.

"We are now in the middle of the rainy season, and taking the climate from one year's end to another it is a very fine one. Things in general are very bad in South Rhodesia. Everybody is hard up in this town. The excessive railway rates on the Beira and Mashonaland Railway are doing a great deal of harm. This year there is a good crop, and the first time in which the place has been in a position to export; but the freights charged prevent exporting at a profit. Tobacco and cotton promise to do well."

NOTES FROM BENGAL.—Major G. D. Hunter writes: "Several changes have lately occurred in the distribution of Medical Officers in the Bengal Command.

"Lieut.-Col. W. T. Johnston has gone home on completion of tour, and has been relieved at Jubbulpore by Lieut.-Col. A. H. Burlton.

"Lieut.-Col. Cowen, on completion of tour, has been replaced at Allahabad by Lieut.-Col. Haslett, and Lieut.-Col. Carey has also left for England. Lieut.-Col. Moffitt is commanding the Station Hospital at Lucknow, Lieut.-Col. H. L. Battersby at Bareilly, Lieut.-Col. W. Rowney at Cawnpore, and Lieut.-Col. Barratt at Agra.

"Surg.-Gen. Sir T. J. Gallwey is leaving India on eight months' leave, and Surg.-Gen. W. F. Burnett officiates at Simla during his absence as P.M.O. H.M.'s Forces in India.

"Col. R. de la C. Corbett goes to Naini-Tal as P.M.O. Bengal Command, and is relieved as P.M.O. Oudh and Rohilkhand Districts by Lieut.-Col. Inman from Meerut."

NOTES FROM LUCKNOW.—Major Beach writes: "Major Blenkinsop, Capts. Steele and Conway, and Lieut. Stack have joined the district for duty.

"Capt. J. G. Haughton has proceeded to South Africa on trooping duty with the 5th Dragoon Guards.

"Lieut.-Col. A. W. Inman has come from Meerut to officiate as P.M.O. O. and R. Districts, with the rank of Colonel.

"Lieut.-Col. T. B. Moffitt has proceeded to Allahabad to officiate as P.M.O. Allahabad and Nerbudda Districts, with the rank of Colonel, *vice* Col. Beamish, appointed officiating P.M.O. Bengal Command.

"This leaves Major Blenkinsop as S.M.O. Lucknow and O. C. Station Hospital.

"The hot weather is coming on apace; old Lucknowites will know what this means, and their sympathy is invited."

NOTES FROM PUNJAB.—Capt. Birrell writes: "Lieut.-Col. D. O'Sullivan has been appointed to command of the Station Hospital, Mian Mir; Lieut.-Col. T. P. Woodhouse has been appointed to command of the Station Hospital, Umballa; Lieut.-Col. W. A. Morris has been appointed to command of the Station Hospital, Sialkot; Major C. C. Reilly has been appointed to command of the Station Hospital, Murree; Major E. Davis has been appointed to command of the Station Hospital, Subathu; Capt. N. Tyacke has been appointed to command of the Station Hospital, Jutogh. The appointment of Capt. W. R. P. Goodwin to officiate as Personal Assistant to the P.M.O. Punjab Command, during the absence of Capt. E. T. F. Birrell on six months' leave out of India, has been approved."

Postings.—On arrival in India the undermentioned officers have been posted to stations noted against their names:—

Lieut.-Col. D. O'Sullivan, Mian Mir, for command of the Station Hospital; Capt. K. M. Cameron, Umballa; Lieut. R. Storrs, Umballa; Lieut. J. M. M. Crawford, Mian Mir.

Transfers.—Capt. E. B. Knox has been transferred from the Madras to the Punjab Command.

Departures.—Lieut.-Col. W. Keays has been transferred to Home Establishment, with effect from February 28, 1904, on the expiration of his leave.

The following officers left for England, tour expired on the dates noted against their names:—

Lieut.-Col. F. B. Maclean, February 26, 1904; Lieut.-Col. H. L. E. White, February 16, 1904; Major A. O. C. Watson, February 16, 1904.

Examinations.—(1) Extract from India Army Orders, dated February 1, 1904:—

"63—*Royal Army Medical Corps Examinations.*—At the examination of Majors for promotion to Lieut.-Colonel, held in India in November, 1903, the undermentioned officers passed in the subjects prescribed in Appendix VIIIA. (now altered to VIIIB.), King's Regulations, headings (2) to (5): Majors C. C. Reilly, R. G. Hanley, L. T. M. Nash, J. C. Weir, M.B.

(2) The undermentioned Lieutenants, R.A.M.C., qualified in subject (h-i) on the dates noted:—

Lieut. H. Rogers, Mian Mir, January 22, 1904; Lieut. H. W. Long, Ferozepore, February 26, 1904; Lieut. T. F. Ritchie, Ferozepore, February 26, 1904.

NOTES FROM POONA.—Lieut. T. I. Potter writes: "Major Carr has gone to Mhow to take over the appointment of Staff Surgeon. Lieut. Rutherford has returned to Poona on completion of duty with the Boer prisoners of war. Capt. Herrick has been transferred from Satara to Poona, where he has been appointed Röntgen Ray Specialist. Lieut. Dunbar, who has recently come out from home, is doing duty at the Station Hospital, Poona.

"The R.A.M.C. four were beaten by the Sapper four; but to make up for this, several other events were carried off by the Corps.

"Capt. Delap won the Canoe Race, Major Hale, D.S.O., won the Senior Sculls, and Major and Mrs. Hale had a walk over in the mixed doubles.

"Capt. Delap, also won the Junior Sculls in very easy style, winning by several lengths from Capt. Ross, R.A.M.C.—last year's winner. Capt. Ross was at a disadvantage, as he had only a few days' training.

"The Oxenham Double Sculls fell to Major Hale and Capt. Dorgan.

"The R.A.M.C. were 'at home' on the last day of the Regatta.

"The Government of Bombay goes to Mahableshwar on the 16th inst.

"Surg.-Gen. Gubbins, M.V.O., went to Mahableshwar on the 9th inst."

NOTES FROM BLOEMFONTEIN.—Capt. Goddard suggests: "That the 'Corps News' of the JOURNAL be printed separately from the professional articles, and sold to the rank and file of the Corps at a suitable price.

"We are expecting Capt. Gill back from leave shortly, and soon after his arrival Col. Goggin and Capt. Ormsby will proceed on six months' leave.

"Good rains have fallen, and the weather is now delightful."

NOTES FROM MALTA.—The Principal Medical Officer, Malta, writes: "Mediterranean fever is a most important subject for us at present, and the past year has been exceptionally bad from this cause. Some of the young officers are very keen on investigating it; but, as you know, it is quite impossible to have them always at Headquarters; they must take their turn out in camp and at Gozo. The staff of our officers in this command is quite too small to allow of much time for research work. I have twenty-one R.A.M.C. officers, three of whom are on sick leave, two at Crete, seven at out-stations, and one who is Sanitary Officer. It is not the hospital work that is heavy, but the endless families in the district. There are also two camps at the other end of the island which have been started lately, and they absorb two of my officers.

"The fever was most prevalent for the past twelve months in the 1st K.R.R. Corps, quartered in the Floriana Barracks. The families living in the new quarters there, also those of the Royal Engineers on the other side of the road nearer Valetta, all of which were only finished last autumn, suffered severely. A good many cases were sent in from the permanent camp at Ghain Taffirho. There are many theories started, but so far no facts have come to light. July is the prevalent season for the fever; but, unfortunately, we have plenty of it with us now (March, 1904). There are three ladies and four officers down with it, besides lots of the troops.

"I think we have broken the back of the malaria at Crete—we had only 222 cases last year, against 1,036 in 1902."

DIPLOMA IN TROPICAL MEDICINE.—The University of Liverpool grants a Diploma in Tropical Medicine (D.T.M.) to candidates who possess a qualification to practise medicine recognised by the University, and who present certificates of attendance on the following courses of study, and pass the prescribed examination:—

(*a*) A three months' course of study in Tropical Pathology and Hygiene in the University; (*b*) a course of instruction in a hospital recognised by the University, in which beds are specially reserved for Tropical Diseases.

The examination for the Diploma is held at the end of the autumn, Lent and summer terms, and the first examination will be held at the end of the summer term, 1904.

Further information can be obtained on application to the Dean of the Faculty of Medicine.

THE CORPS MEMORIAL FOR THE SOUTH AFRICAN WAR.

THE Corps Memorial for the South African War, of which a photograph from the model is reproduced herewith, has been designed by Mr. Weir Schultz. The total height to the top of the obelisk is 26 feet, the width about 23 feet. The material for the stonework is Cornish granite, and the obelisk itself is in one piece. There are fourteen bronze tablets, on which the names of all ranks who fell during the campaign will be placed; the lettering will be in block type, not incised, but cast with the tablet.

The bas-relief has been designed by Mr. Goscombe John, A.R.A., who has lately done a great deal of work of the same type. The figures are about life-size, and the group will be cast in bronze. The lions supporting the column and the tripods are also in bronze. It is hoped that the Committee may be able to obtain metal from old guns for use in place of ordinary bronze.

An excellent and commanding site has been obtained close to our Mess at Aldershot.

In the preparation of the design Mr. Weir Schultz had the advantage of consultation with the late Dr. Murray, the head of the Greek department of the British Museum, an authority on Greek art, whose pre-eminence was recognised throughout Europe. Dr. Murray took a great personal interest in the Memorial, and placed his unequalled knowledge of Greek monumental art freely at the disposal of Mr. Schultz.

The estimates for the various component parts of the Memorial and its erection absorb the whole sum—£1,100—that has been subscribed. A small sum—probably about £200—will be required to cover incidental expenses, including the laying out, replanting and railing in of the site close to the Mess at Aldershot.

As a proportion of officers of the Corps have not yet forwarded their subscriptions, it is hoped that those who propose to subscribe, but have not yet done so, will forward either a cheque or a banker's order for payment, either to Messrs. Holt and Co., or to the Hon. Secretary, R.A.M.C. Memorial Fund (South Africa), at 68, Victoria Street, S.W.

R. J. S. SIMPSON.

OBITUARY NOTICE.

DEPUTY SURG.-GEN. HENRY CAYLEY, F.R.C.S.Eng., C.M.G., H.S.K., Indian Medical Service (Retired).

THE death of this well-known and popular officer took place at Weybridge on March 19, at the age of 70.

The event will have caused surprise to many who, knowing his great vitality and energy, would reasonably have predicted for him more than average longevity. The symptoms which preceded his fatal illness were obscure, and

The Corps' Memorial for the South African War.

apparently resulted from an injury to the cervical spine, caused by a fall off horseback some four years ago. Numbness and tingling of the fingers were the first indications of spinal mischief. These phenomena were at first slight and slow; but severe neuralgia and anasthesia set in, followed by œdema. The lower extremities became similarly affected, the power of swallowing was abolished, and both respiration and circulation were disturbed. These conditions progressed rapidly towards the end, and great emaciation and exhaustion ensued; and although latterly the pain and œdema disappeared, and sensation and power returned in some measure, asthenia progressed and proved lethal.

Deputy Surg.-Gen. Cayley's life and career were highly meritorious, and worthy of record and imitation. He was descended of a good Yorkshire family, born in 1834, studied medicine in King's College, and obtained the Membership of the College of Surgeons of England in 1855. He competed for the Indian Medical Service and came out first. His commission as Assist.-Surg. was dated January 29, 1857, and he arrived in Calcutta on April 28 of that year. After doing duty for a time in the Presidency General Hospital, and with the 54th Regiment in Fort William, he was sent up to Benares in June with a detachment of the 37th Regiment, and subsequently served at Allahabad with the 38th Regiment, and had medical charge of troops in the Fort of Rajghat. He saw no active service in the mutiny, but obtained the mutiny medal for the duties just mentioned. He was appointed to the Civil Surgeoncy of Gorakpur with charge of the 2nd Sikh Police Corps in March, 1858, and remained there, excepting an interval of fourteen months on sick furlough, till March, 1864. His next charge was the joint Civil Surgeoncy of Simla, which he held for two years; and he subsequently obtained Civil employ in Bengal, having charge successively of the Districts of Burdwan and Howrah. In 1867, he was selected for special duty at Ladak, a hilly district of Kashmir, with headquarters at Leh. This was a political charge, with the status of Resident and Joint Commissioner. The main objects were commercial and political—to encourage trade with Central Asia, by removing oppressive imposts and exactions, improving highways, and promoting exchange of Indian and other products and manufactures. He was also required to watch and report on the commerce and political state of these regions. The district of Ladak, of high altitude, is surrounded by lofty hills and approached by difficult passes. It is only accessible for three months of the year. Cayley's reports were elaborate and instructive, and were highly appreciated by the Government of India and the Secretary of State for India, who thanked him repeatedly for the tact, zeal, energy and ability with which he discharged his duties. He started a dispensary at Leh, which was well attended, and this tended greatly to facilitate his work. He also started vaccination in the district of Ladak.

In 1871, after thirteen months' furlough, he returned to Bengal, and held medical charge of the important districts of twenty-four Pergunnales and Cuttack. During his stay in England he had studied eye diseases at Moorfields, and, on a vacancy occurring, he was appointed Superintendent of the Calcutta Eye Infirmary and Professor of Ophthalmic Surgery in the Calcutta Medical College Hospital. He was also Surgeon Superintendent of the Mayo Hospital for Natives, and *ex-officio* Presidency Surgeon. From 1872 to 1884 he was in the full swing of Calcutta practice, and was greatly esteemed both as a consultant and private medical attendant. His work was exceedingly laborious and eminently successful. In January, 1885, while on furlough prior to his retirement in 1887, he was appointed member of the Medical Boards at the India and War Offices, and in May, 1889, he was sent to complete the course of lectures on Military medicine at Netley, which the sudden illness of Professor D. B. Smith left unfinished. This duty he performed so acceptably and well that he was appointed permanently to the Professorship of Military Medicine in the Army Medical School in August of the same year. He held this appointment for eight years, and performed his duties with diligence and discretion. Many generations of Medical Officers of both Services, who passed through the school during these years, retain a kindly recollection of his painstaking and practical instruction. On the outbreak of the South African War, Deputy Surg.-Gen. Cayley, who had settled at Weybridge, tendered his services, and was appointed with the rank of Col. to command the Scottish National Red Cross Hospital. His services, which were energetic and efficient,

were acknowledged in despatches, and he obtained the South African medal with clasps, and was rewarded with the companionship of the Order of St. Michael and St. George. In 1884 he obtained the Fellowship of the College of Surgeons of England, and in 1891 he had been appointed Honorary Surgeon to the Queen.

This brief sketch of Col. Cayley's career indicates that his life was active, useful and successful in a high degree. He was a man of slight make, but full of go. His disposition was kindly and sense of truth and honour conspicuous. He was faithful to his duties and responsibilities in every capacity and relation of life. He possessed good faculties, quick perception and sound judgment. He was devoted to his profession, and entertained lofty ideals of its ends and uses. He was not a great writer, but many sensible and practical contributions to the medical journals remain, evidencing shrewd observation and sound deduction. He was devoted to riding, hunting and boating. He was a staunch and steadfast friend and universally liked. His upright, character, frank and straightforward manner, and gentle kindness won the hearts of all who knew him.

He leaves a widow and eight children—six sons and two daughters.

BIRTHS.

FAIRRIE.—On March 24, at Oswald House, Cleveland Road, South Woodford, London, N.E., the wife of Capt. S. H. Fairrie, M.B., R.A.M.C., of a son.

SMITH.—On March 15, 1904, at Barcaldine, Osborne Road, Farnborough, the wife of Capt. C. Seaver-Smith, of a daughter.

DEATHS.

ALCOCK.—Lieut.-Col. Nathaniel Alcock, late Royal Army Medical Corps, died on the 4th inst. at Bellevue, Ballybrack, co. Dublin, aged 64. He entered the Service as an Assist.-Surg. in October, 1860, became Surg. in March, 1873, was promoted Surg.-Major in September, 1875, and retired in August, 1889, with the rank of Lieut.-Col. He was a licentiate of the Royal College of Physicians and of the Royal College of Surgeons of Ireland. He served in the Kaffir war of 1878, receiving the medal.

WOOLCOMBE.—On March 7, 1904, at Westbury-on-Trym, near Bristol, Robert William Woolcombe, late Assist.-Surg., Staff, in his 85th year. He entered the Service on March 28, 1845; was placed on half-pay December 13, 1850; reappointed as Assist. Surg., Staff, September 25, 1855; and retired on February 1, 1857.

BISSET-SNELL.—On February 20, 1904, at 14, Keville Terrace, Brompton, London, Honorary Deputy Surg.-Gen. William Bisset-Snell, late Surg.-Major Army Medical Department, in his 74th year. He entered the Service on May 6, 1853; and retired June 12, 1878.

CORBETT.—On March 24, 1904, at Lucknow, India, Col. Robert de la Cour Corbett, M.D., D.S.O., F.R.C.S.I., from hepatitis, in his 60th year. He entered the Service on October 1, 1867; was appointed Surg. March 1, 1873; Surg.-Major, October 1, 1879; Surg.-Lieut.-Col., October 1, 1887; Brig.-Surg.-Lieut.-Col., June 3, 1893; and Surg.-Col., June 22, 1898. He served in the Burmese Expedition, 1886-7; mentioned in Despatches, *London Gazette*, September 2, 1887—D.S.O. Had over twenty-six years' service abroad, nearly all of which was spent in Bengal. He was specially selected as President of a Committee, assembled in 1900, for the purpose of considering the supply, expenditure and method of accounting for Hospital stores in India. For his services on this Committee he received the thanks of the Government of India.

WATSON.—On March 15, 1904, at Canterbury, from rheumatic fever, Lieut.-Col. John Watson, M.D., in his 47th year. He entered the Service on March 6, 1880; was promoted Surg.-Major, March 6, 1892; Lieut.-Col., March 6, 1900; and Lieut.-Col. with higher rate of pay, June 6, 1902. He took part in the Operations in Chitral, 1895—with the Relief Force. Medal with clasp.

ROYAL ARMY MEDICAL CORPS ANNUAL DINNER.

THE Annual Dinner of the Corps will take place on Monday, June 13, at the Hotel Metropole, at 8 o'clock precisely; the Director-General in the Chair. Officers intending to dine are requested to inform the Hon. Secretary as soon as possible, in order that the probable number attending may be known and that tickets may be sent.

All subscribers to the R.A.M.C. Fund, except any who may have expressly excluded the Annual Dinner in the allocation of their subscription, will be entitled to dine at subscribers' rates, provided that their subscriptions are credited to the R.A.M.C. Fund before the date of the Dinner. Also all officers who do not subscribe to the R.A.M.C. Fund, but who still subscribe to the former R.A.M.C. Dinner Fund.

The price of the Dinner to subscribers will be reduced as much as the Fund will permit, but the exact amount cannot be fixed until the number of subscribers attending is known. For the last few years the charge has been 12s. 6d. The amount should be paid personally at the Hotel on the evening of the Dinner.

The price to non-subscribers will be £1 15s., which must be sent by cheque or Post Office Order to the Hon. Secretary when applying for tickets. If the officer is unable to dine the money will be returned.

E. M. WILSON, *Lieut.-Col., R.A.M.C.,*
Hon. Sec. Sub-Committee R.A.M.C. Dinner Fund.

5, *Drayton Gardens,*
South Kensington, W.

THE ROYAL ARMY MEDICAL CORPS FUND.

NOTICE OF SECOND GENERAL MEETING.

THE Second General Meeting of Subscribers to the Fund will be held in the Theatre of the Royal United Service Institution, on Monday, June 13, 1904, at 3 p.m. The Director-General, Sir William Taylor, K.C.B., K.H.P., will preside.

It is hoped that officers will freely express their views on any points connected with the Fund which they may wish discussed. The Director-General feels that this meeting gives him a unique opportunity of obtaining the real views of the Corps on the important subjects dealt with by the Fund. If subscribers will avail themselves of this opportunity for discussion it will facilitate the work of the Director-General and the Committee in administering the Fund according to the wishes of subscribers.

He would specially draw the attention of subscribers to the Compassionate Fund, concerning which he hopes to make a statement.

Those officers who wish for information at the meeting on any special point are asked to communicate with the Hon. Secretary, in order that facts and figures may be collected to elucidate any question asked.

ELEVENTH MEETING OF THE COMMITTEE.

The Eleventh Meeting of the Committee was held at 68, Victoria Street, S.W., on Wednesday, April 13, 1904, at 3 p.m.

Present.

Surg.-Gen. Sir William Taylor, K.C.B., K.H.P., Director-General A.M.S. (Chairman).
Surg.-Gen. H. Skey Muir, C.B., Representing Retired Officers.
Surg.-Gen. W. H. McNamara, C.B., C.M.G.
Col. A. T. Sloggett, C.M.G.
Col. H. E. R. James.
Lieut.-Col. E. M. Wilson, C.B., C.M.G., D.S.O.
Lieut.-Col. R. H. Firth.
Capt. G. St. C. Thom.
Capt. and Quartermaster G. Merritt.

(1) The Minutes of the Tenth Meeting were confirmed.

ROYAL ARMY MEDICAL CORPS COMPASSIONATE FUND.

WIDOWS' AND ORPHANS' FUND.

BALANCE SHEET FOR THE QUARTER ENDED MARCH 31, 1904.

DR.

1903.	RECEIPTS.		£ s. d.
Dec. 31	Balance Credit last quarter:—		
	At Bank		20 3 8
	On Deposit		810 1 7
			£830 5 3

CR.

1904.	EXPENDITURE.		£ s. d.
Jan. 1 to Mar. 31	Disbursements to 15 Widows and 1 Orphan (monthly)		74 10 0
Mar. 31	Clerk	£0 7 6	
	Postage	0 3 1	
	Cheque Book	0 5 0	
			0 15 7
Feb. 8	Society for Waifs and Strays, London, Authority H. Q. Letter:—		
	Grant to Fund		10 0 0
	Balance Credit:—		
	At Bank	£34 18 1	
	On Deposit	710 1 7	
			744 19 8
			£830 5 3

GENERAL RELIEF FUND.

BALANCE SHEET FOR THE QUARTER ENDED MARCH 31, 1904.

DR.

1904.	RECEIPTS.	£ s. d.
Jan. 1	Balance Credit:—	
	At Bank	46 9 1
	On Deposit	101 17 1
Feb. 18	Bank, Interest on Deposit	0 6 7
Mar. 25	R.A.M.C. Fund—For General Relief (April payments)	20 0 0
		£168 12 9

CR.

1904.	EXPENDITURE.		£ s. d.
Jan. 1 to Mar. 31	Disbursements to Six Cases requiring Monthly Relief		33 10 0
Ditto	Lieut.-Col. E. M. Wilson (For Urgent Cases) ..		10 0 0
Feb. 23	R.A.M.C. Fund — For Princess Christian Cottage Home		100 0 0
Mar. 31	Clerk	£0 7 6	
	Postage	0 2 5	
			0 9 11
	Balance Credit:—		
	At Bank		24 12 10
			£168 12 9

(*Signed*) H. A. HINGE, *Capt.*,
Hon. Sec.

ALDERSHOT,
April 8, 1904.

ROYAL ARMY MEDICAL CORPS BAND FUND.

BALANCE SHEET FOR QUARTER (JANUARY—MARCH), 1904.

DR. | CR.

1904.	RECEIPTS.	£	s.	d.	1904.	EXPENDITURE.	£	s.	d.
Jan. 14	Credit Balance from last quarter..	14	7	10	Jan. 31	Pay of Band (January)	19	8	10
,, 14	President, R.A.M.C. Mess (December Subscription)	6	4	0	Feb. 29	Pay of Band (February)	18	19	0
,, 25	Hon. Sec. R.A.M.C. Fund (quarterly grant) ..	60	0	0	Mar. 31	Pay of Band (March)	19	19	2
Feb. 12	President R.A.M.C. Mess (January Subscription)	6	5	0	,,	Messrs. Hawkes and Co. (Instrument makers) for new instruments, music, repairs	23	19	3
Mar. 15	President, R.A.M.C. Mess (February Subscription)	3	0	0	,,	Messrs. Gale and Polden	0	2	6
Jan.-Mar.	Subscriptions from Officers at 5s.	1	10	0		By Balance Credit	8	18	1
		£91	6	10			£91	6	10

April 8, 1904.

(*Signed*) H. A. HINGE, *Capt.*,
Hon. Sec.

THE ROYAL ARMY MEDICAL CORPS ANNUAL DINNER FUND.

STATEMENT OF ACCOUNTS FOR YEAR ENDING DECEMBER 31, 1903.

DR. | CR.

1903.	RECEIPTS.	£	s.	d.	1903.	EXPENDITURE.	£	s.	d.
Mar. 6	To balance, cash in hand..	78	14	0	Mar. 12	By Stationery, Postage, &c.	6	3	8
	,, 150 Subscribers at 5s. each	37	10	0	June 9	,, Messrs. May and Williams, advertising ..	3	17	6
	,, Cheques, cash and arrears	10	7	6	,, 12	,, Tobacco and Cigarettes	12	13	4
	,, Receipts from R.A.M.C. Fund	100	0	0	,, 16	,, Paid to Hotel Metropole	185	7	6
						,, Repayments, &c.	3	12	6
						,, Commission	5	5	0
							216	19	6
						,, Balance, cash in hand	9	12	0
		£226	11	6			£226	11	6

March 30, 1904.

(*Signed*) E. M. WILSON, *Lieut.-Col.*
Hon. Sec.

(2) With reference to Minute 10 of the Ninth Meet ng, it was unanimously resolved that the Director-General, Sir William Taylor, should ask Her Royal Highness Princess Christian to permit the "Princess Christian Cottage Home for the R.A.M.C." to be dedicated to the memory of her late son, H.H. Prince Christian Victor of Schleswig-Holstein.

(3) The report and accounts to March 31 last for the Widows' and Orphans' Branch of the Compassionate Fund were approved by the Committee, and are shown on page 646.

A detailed statement of cases receiving relief from this as well as from the General Relief Fund was furnished with these accounts, and is filed for future reference.

(4) The accounts of the General Relief Branch of the Compassionate Fund were approved, and are shown on page 646.

A grant of £50 was voted to this Branch to meet the requirements of the current quarter. Surg.-General McNamara explained that this would supply a sufficient balance to carry on the work of the Fund during the first month of the next quarter.

After the disposal of kits from South Africa, a balance of £14 16s. 5d. remained in the hands of the officer commanding the Depôt R.A.M.C. He obtained the approval of the G.O.C. 1st Army Corps that this balance, together with the proceeds of the sale of articles remaining on hand, should be put to the credit of the Compassionate Fund, R.A.M.C., on the understanding that should any of this money subsequently be found to belong to any claimant, a proportionate allowance from the Fund should be made to him in recompense. With the consent of the Director-General it was agreed that this money should be allotted to the General Relief Fund.

(5) The accounts of the Band Fund for the quarter ended March 31 last were approved, and are shown on page 647.

The Band Sub-Committee asked for a grant of £100 to meet expenses, which included considerable expenditure on instruments. It was pointed out that such a large expenditure could only be incurred at the expense of the requirements of future quarters, and it was resolved that the purchase of new instruments should be undertaken gradually. For this purpose a sum of £18 18s. was voted for the purchase of one string bass, and £7 7s. for that of one "B flat" clarionet, and a further sum of £50 for expenses for the quarter.

(6) The report and accounts of the Dinner Fund Sub-Committee for the year ended December 31, 1903, were considered and approved, and are shown on page 647.

It was noted that Lieut.-Colonel Hector, owing to ill-health, had retired from the Sub-Committee, and that the Sub-Committee had sent a letter accepting his resignation with great regret, and unanimously according him its most sincere thanks for the long and valuable services which he had rendered in connection with the Annual Dinner. The Committee cordially endorses this vote of thanks.

On the proposal of Colonel Sloggett, seconded by the Director-General, Surg.-General H. S. Muir was unanimously elected by the Committee to fill Lieut.-Col. Hector's place on the Dinner Sub-Committee, a position which Surg.-General Muir accepted with thanks.

The following acting Sub-Committee for the Annual Dinner was approved: Col. A. T. Sloggett, Surg.-Gen. W. G. Don, Lieut.-Col. E. M. Wilson (Hon. Secretary).

(7) The Director-General notified that on March 15 last he had received the sum of £423 15s. 3d. from Lieut.-Col. F. A. B. Daly's Military Hospital Mineral Water Factory at Standerton, which was placed to the credit of the R.A.M.C. Fund, it having been allocated by the donors to the credit of the Widows' and Orphans' Fund. Further, the G.O.C. South Africa ruled that it must be used strictly for a South African case of distress, as the money had been made in South Africa.

The Director-General, in acknowledging receipt, pointed out that this limitation detracted from the value of the gift to the Corps, inasmuch as it could not be touched for cases of distress among men, while our Funds for Widows and Orphans were more than ample.

He pointed out that the most beneficial charity would be to entrust donations to the R.A.M.C. General Relief Fund, when the moneys could be applied to relief of men, women, or children of the Corps, whichever, at any time, presented the most urgent needs.

(8) The Director-General notified that the creation of a trust to be called the de Chaumont prize, as set forth in Minute 11A of the Ninth Meeting, has been approved by the Army Council.

The Accountant-General was asked if the Treasury Solicitor would draw up the Trust Deed. He suggested that the course to pursue would be to invest the amount in the names of the Secretary of State and the Assistant Paymaster-General for the time being, as was done in the case of the Sidney Herbert prize.

As the trust for this latter prize appears to be on a thoroughly business footing, the Director-General informs the Committee that he is now asking that the Treasury Solicitor may be approached with a view to creating a trust in the names originally proposed by the Committee, and approved by the Army Council.

(9) The following officers have accepted membership in the R.A.M.C. Fund as proposed at the last meeting (Minute 12):—

Lieut.-Col. C. A. MacMunn, 3rd Vol. Batt. South Staffordshire Regiment.
Lieut.-Col. J. Duncan, 3rd Vol. Batt. Manchester Regiment.
Major C. Stonham, C.M.G., Middlesex Imperial Yeomanry.
Capt. H. E. Dalby, Militia, North-Eastern District.
Lieut. S. T. Beggs, Militia, Belfast District Company.

(10) The Committee was informed that the memorial brass to Surg.-General J. B. Hamilton had been erected, and Surg.-General McNamara informed the Committee that the brass was a handsome one and occupied a conspicuous position in the library of the Cambridge Hospital, Aldershot.

(11) Col. James notified that the artist who was to have copied the pictures for the V.C. Gallery was unable to do so, and that he was now taking steps to find an artist who would satisfactorily perform the work. He noted certain suggestions made by members of the Committee.

April 14, 1904. B. Skinner, *Lieut.-Col.*, *Hon. Sec.*

Officers are informed that the model of the memorial which is to be erected at Aldershot to those of the Corps who died in South Africa, is now on view in the Officers' waiting-room (fourth floor), at 68, Victoria Street.

NOTICE TO SUBSCRIBERS.

OFFICERS are particularly requested to give timely notice of changes of station or changes of address, in order to ensure the posting of the Journal to its correct destination.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, &c. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts and commands at home and abroad. All these communications should be written upon one side of the paper only, and be addressed to the Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 68, Victoria Street, London, S.W.

Letters regarding subscriptions, non-delivery of the Journal, or change of address, should be sent to Major T. McCulloch, R.A.M.C., 68, Victoria Street, London, S.W.

Communications have been received from Cols. Ligertwood, Wolseley; Lieut.-Cols. R. Simpson, M. W. Russell, A. Davies, R. H. Firth; Majors F. J. Morgan, Mawhinney, Leishman, S. G. Allen, Fahrer; Capts. L. E. L. Parker, E. P. Lewell, A. Chopping, H. W. Grattan, H. Ensor; Lieut. W. Brown; Dr. A. Balfour.

In the event of reprints of articles being required by the authors, notification of such must be sent when submitting the papers. Reprints may be obtained at the following rates:—

	s.	*d.*		*s.* *d.*		*s.* *d.*
25 Copies of 4 pp.	4	6	Of 8 pp.	7 6	Extra for covers	4 0
50 ,, ,,	5	6	,,	9 0	,,	5 0
100 ,, ,,	7	6	,,	12 6	,,	6 6
200 ,, ,,	11	6	,,	19 0	,,	9 0

CASES FOR BINDING VOLUMES.—Strong and useful cases for binding can be obtained from the publishers at the undermentioned rates:—

Covers, 1*s.* 4*d.* net; binding, 1*s.* 2*d.*
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In forwarding parts for binding the name and address of sender should be enclosed in parcel.

The following periodicals have been received: *The Medical Record, The Medical News, New York Medical Journal, Gazette Med. de Paris, Il Morgagni, The Medical Review, El Siglo Medico, Der Militärärzt, Deutsche Militärärztliche Zeitschrift, Anales de Sanidad Militar, Revue Med. de la Suisse Romande, La Medicina Militar Española, The Boston Medical and Surgical Journal, Annali di Med. Navale, Giornale del Regio Esercito, Le Caducée, The Hospital, The Ophthalmoscope, St. Thomas's Hospital Gazette, Bulletin de l'Acad. de Med. de Paris, Arch. Med. Belges, Voyenno Medisinskii, The Indian Medical Gazette, The Australasian Medical Gazette, Journal of the Association of Military Surgeons, U.S., Militarlagen ungwet af Militarlaegeforeningen,* J. Kjobenhaur, *The Veterinary Journal, The Practitioner, Public Health, Medical Review, Journal of Infectious Diseases, Chicago.*

VOLUME II. JUNE, 1904. No. 6.

Journal

of the

Royal Army Medical Corps.

Original Communications.

THE HOUSE-FLY AND CERTAIN ALLIED SPECIES AS DISSEMINATORS OF ENTERIC FEVER AMONG TROOPS IN THE FIELD.

BY ERNEST E. AUSTEN,

Zoological Department, British Museum.

(Author of "A Monograph of the Tsetse-Flies," &c.)

IT may confidently be asserted that, of insects which directly or indirectly affect the welfare of man and his domestic animals, the vast majority belong to the Order *Diptera*, or flies. Other Orders include noxious species, but in none are the baneful influences so diversified or so widely spread. Apart from the vast army of blood-suckers constituted by the midges, mosquitoes, buffalo-gnats (*Simulium*), horse-flies, tsetse-flies, and the allies of the latter (*Stomoxys*, *Lyperosia*, &c.), other forms (*Œstridæ* and certain *Muscidæ*) affect man and his horses and cattle as subcutaneous and intestinal parasites, the mischief in this case being wrought by the larvæ. Others, again, of which the house-fly is a notorious example, browse on and pollute man's food and drink; while the phytophagous larvæ of yet other species frequently cause serious damage to crops. In an Order of insects so closely connected with man, it is consequently not surprising that many species should prove to be carriers of pathogenic micro-organisms, either introducing them into the blood at the moment of puncturing the skin with their proboscis (blood-sucking forms), or, in the case of certain

species which are incapable of sucking blood, acting as mechanical living vehicles of infective matter. It is in the latter sense that we have to consider the flies which form the subject of this article.

In intestinal diseases, such as cholera* and enteric fever, which are due to micro-organisms, the essence of the danger from flies lies in the overwhelming attraction which fæcal matter possesses for these insects. In hot climates the trained entomologist will often be struck by finding at deposits of ordure, in addition to the recognised dung-feeding forms, many flies not usually supposed to be coprophagous. In these cases, however, the moisture is probably the attraction, and such flies, not being likely afterwards to come into contact with human beings, need not here be further considered. The important species, for troops in the field, are those of which the best known examples are described and illustrated below, which in standing camps in South Africa during the late campaign were found to divide their activities between the latrines and the men's mess-tins and jam rations.

Recent medical literature, including the Annual Reports of the Army Medical Department, abounds with statements bearing testimony to the importance of flies under certain circumstances as actual or potential carriers of *Bacillus typhosus*. The experience gained in the Volunteer camps of the United States, during the Cuban campaign of 1898, has been emphatically confirmed in our own case during the Boer War, besides receiving further indirect support from the observations of those who have investigated recent outbreaks of enteric fever among the British Army in India. Nevertheless, there seems only too much reason to suppose that the subject has not yet received the consideration to which its importance entitles it, and it is consequently unnecessary to apologize for drawing the attention of readers of this JOURNAL to the matter. Before proceeding, then, to furnish some account of the appearance of certain typical species of flies, which from their habits and abundance in hot climates, such as India and South Africa, are most likely to convey the typhoid bacillus, it may be worth while to give a few extracts from the evidence as to the connection between flies

* For an interesting summary of the evidence as to dissemination of cholera by flies, see pp. 27-30 (separate pagination) of Dr. G. H. F. Nuttall's memoir, "On the Rôle of Insects, Arachnids, and myriapods, as Carriers in the Spread of Bacterial and Parasitic Diseases of Man and Animals: a Critical and Historical Study," (*Johns Hopkins Hospital Reports*, vol. viii., 1899, pp. 1-155 (sep. imp.), Plates I.-III.). Nuttall considers the evidence "as to the *rôle* of flies in the diffusion of cholera" as "absolutely convincing."

and enteric fever which has accumulated during the last five or six years.

The Commission appointed to investigate the cause of the epidemics of enteric fever in the Volunteer camps in the United States, during the Spanish-American War of 1898, found that "The water supply was in most places good, and was not responsible for the spread of the fever. This was effected, in the opinion of the members of the Commission, by the flies which swarmed in all the camps and devoted their attentions impartially and alternately to the fæcal matters in the open and not disinfected sinks (latrines) and to the hard-tack and 'sow belly' of the troops."* These remarks by the American Commissioners are supported by Dr. M. A. Veeder, who states, with reference to standing camps in the same campaign, that he "has seen fæcal matter in shallow trenches open to the air, with the merest apology for disinfection, and only lightly covered with earth at intervals of a day or two. In sultry weather this material, fresh from the bowel and in its most dangerous condition, was covered with myriads of flies, and at a short distance there was a tent, equally open to the air, for dining and cooking. To say that the flies were busy travelling back and forth between these two places is putting it mildly." "There is no doubt," continues this author, "that air and sunlight kill infection, if given time, but their very access gives opportunity for the flies to do serious mischief as conveyers of fresh infection wherever they put their feet. In a very few minutes they may load themselves with the dejections from a typhoid or dysenteric patient, not as yet sick enough to be in hospital or under observation, and carry the poison so taken up into the very midst of the food and water ready for use at the next meal. There is no long, roundabout process involved. It is very plain and direct, and yet when the thousands of lives are at stake in this way the danger passes unnoticed, and the consequences are disastrous and seem mysterious until attention is directed to the point; then it becomes simple enough in all conscience."† The conditions here described by Dr. Veeder were reproduced only too faithfully a year or two later in many a British standing camp in South Africa.

Further evidence as to the experience gained during the Cuban campain of 1898 is summarised by Capt. E. L. Munson, of the

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* *Medical Record*, New York, September 24, 1898, p. 454.

† M. A. Veeder, M.D., "Flies as Spreaders of Sickness in Camps," *Medical Record*, vol. liv. (1898), pp. 429-30.

Medical Department, United States Army, in his recently published text-book of Military Hygiene.*

"Among troops in camps during warm weather," writes the author in question, "the use of food contaminated with typhoid bacilli, brought from the latrines by means of flies, is a factor of the greatest importance in spreading the disease. Numerous observers have demonstrated the presence of the specific bacillus in the excrement of flies made to feed on infected material,† and colonies of typhoid bacilli have been shown to develop in the tracks of flies which had been allowed to settle on typhoid discharges and then made to walk over a suitable solid culture medium. Vaughan states that during 1898, in some of the large military camps, where lime had recently been sprinkled over the contents of the latrines, flies with their feet whitened with lime were seen walking over the food. He also noted that officers whose mess-tents were protected by means of screens suffered proportionally less from typhoid fever than did those whose tents were not so protected. Where flies are numerous in camp and are constantly settling upon and contaminating articles in common use, it is easy to see that, even if the food and drink be protected from their invasion, an infection may readily be brought about by touching the lips with soiled fingers which have come in contact with articles upon which the typhoid bacilli have been deposited.

"The typhoid epidemics of 1898 gradually decreased with the approach of cold weather and the disabling of the fly as a carrier of the infection. Where a strong wind constantly blows from the same direction, a fly-borne infection will chiefly extend down wind, as this insect always rises and generally moves in the direction of air-currents. These insects lay their eggs and hatch out in nearly all organic material, especially if this be in a putrid condition. Howard regards horse manure as the most favourable breeding material, but in the camps of 1898 the larvæ were often seen by myriads in the poorly policed latrines. Sprinkling the contents of the latrines with earth, as ordinarily practised, did not appear to destroy them."

* "The Theory and Practice of Military Hygiene." By Edward Munson, A.M., M.D., Captain, Medical Department, United States Army. London: Baillière, Tindall and Cox, 1901. P. 683.

† Firth and Horrocks (*see below*) state that "It has not been proved that the enteric bacillus passes through the digestive tract of the fly." But, according to Nuttall (*op. cit.*, pp. 30-31, sep. imp.), Celli, in 1888, "fed flies with pure cultures of the *Bacillus typhi abdominalis*, and examined their contents and dejections microscopically and culturally. Inoculations on animals were also made, proving that the bacilli which passed through flies were virulent."—E. E. A.

Passing now to the consideration of recent experience in our own Army, we may note the outbreak of enteric fever among the 2nd King's Royal Rifles, at Diyatalawa Camp, Ceylon, in 1900, while acting as guard over Boer prisoners of war. "During the whole period that enteric fever was rife in the Boer camp, flies in that camp amounted almost to a plague, the military camp being similarly infested, though to a lesser extent."* The outbreak in the Boer camp preceded the commencement of the epidemic in that of the troops, which was immediately outside, and to which the migration of flies laden with bacilli was easy. In Egypt and the Soudan, according to Dr. F. M. Sandwith,† flies "often alight on milk and other exposed food when coming direct from filth. They also endeavour to crawl about the face and mouth of human beings, and are most persistent in this, evidently searching for moisture." It is interesting to note that in hospital tents in South Africa flies appeared to be specially attracted to enteric fever patients. According to Drs. H. H. Tooth, C.M.G., and J. E. G. Calverley, who record their experience in "A Civilian War Hospital,"‡ (pp. 73-74): "In a tent full of men, all apparently equally ill, one may almost pick out the enteric cases by the masses of flies that they attract. This was very noticeable at Modder River, for at that time there were in many tents men with severe sunstroke who resembled in some ways enteric patients, and it was remarkable to see how the flies passed over them to hover round and settle on the enterics. The moment an enteric patient put out his tongue one or more flies would settle on it."

The authors further state that "At Bloemfontein the flies were a perfect pest; they were everywhere, and in and on every article of food. It is impossible not to regard them as most important factors in the dissemination of enteric fever. Our opinion is further strengthened by the fact that enteric fever in South Africa practically ceases every year with the cold weather, and this was the case at Bloemfontein. For though the days after about 10 a.m.

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* "Army Medical Department Report for the Year 1900," p. 452, Appendix No. IV., "Report on an Outbreak of Enteric Fever at Diyatalawa Camp, Ceylon, among the 2nd King's Royal Rifles, during the Period they Acted as Guard over Boer Prisoners of War," by Lieut.-Col. R. H. Quill, M.B., R.A.M.C., Senior Medical Officer, Ceylon.

† *The Practitioner*, No. 427, vol. lxxii.; No. 1, January, 1904, p. 15.

‡ "A Civilian War Hospital: being an Account of the Work of the Portland Hospital, and of Experience of Wounds and Sickness in South Africa, 1900." By the Professional Staff. London: John Murray, 1901.

are as warm as an English summer day, and the temperature in our tents at mid-day was rarely below 70° and often about 80° F., the nights are very cold, and often frosty, and with the cold nights the flies disappeared. It seemed to us that the cold weather reduced the number of the enteric cases by killing these pests." Elsewhere,* Dr. Tooth has some further remarks on the spread of enteric fever in camps by the agency of flies, facilitated as it is by a feature of the malady itself. "No doubt," writes this author, "the indefinite and widely variable invasion-period characteristic of the disease is a prime factor in this question. There are cases in which the most acute medically trained intelligence cannot pronounce with certainty, taking no account of the so-called ambulant cases, which may never come into the ken of the medical officer at all. But these cases are, many of them, capable of imparting infection, and the bacilli in their dejecta, and in some cases in their urine and expectoration, perhaps, may be carried about the camp by the sand-storms and flies. Before they have reported sick, or even before they know themselves to be ill, they may have unwittingly infected many of their comrades."

In a recently published and able article on "Municipal Sewerage,"† Major Fred. Smith, D.S.O., R.A.M.C., has some pertinent remarks on latrine trenches and flies in South Africa, stating that a neglected trench "becomes an open privy with an infected surface soil around it; the flies browse in it in the day-time, and occupy the men's tents at night. On visiting a deserted camp during the recent campaign it was common to find half-a-dozen or so open latrines containing a fetid mass of excreta and maggots. This because the responsible persons so often failed to comply with the regulations for encampments by filling in latrines on the departure of the troops."‡ The present writer can vividly recall a latrine in a certain standing camp in South Africa during the late war, in which the conditions as regards flies were precisely as described by Major Smith. It is only fair to say that the ground was extremely hard and stony, so that very little soil was available for covering up the contents of the trench. On visiting this latrine after it had been left undisturbed for a short time, a buzzing swarm of flies would suddenly arise from it with a noise faintly suggestive of the bursting of a percussion shrapnel shell. The latrine was certainly not more than one hun-

* *The Practitioner, loc. cit.*, pp. 50-51.

† *The Journal of Tropical Medicine*, vol. vi., 1903, p. 285 *et seq.*

‡ *Loc. cit.*, p. 333.

dred yards from the nearest tents, if so much, and at meal-times men's mess-tins, &c., were always invaded by flies. A tin of jam incautiously left open for a few minutes became a seething mass of flies (chiefly *Pycnosoma chloropyga*, Wied., see below), completely covering the contents.

Enough has now been said with regard to this question from the point of view of practical experience, and it is needless to multiply instances in order to prove what must be well within the knowledge of all readers of this JOURNAL who have served in South Africa or India, and will be readily conceded by others; namely, that given swarms of flies in a camp and an open latrine which is possibly being used by incipient or ambulant cases of enteric fever, the presence of the insects constitutes a very serious danger. As to *experimental evidence*, reference has already been made in a footnote (p. 654) to Celli's experiments of 1888, and it will suffice now to refer the reader to those performed at Netley in 1902 by Major (now Lieut.-Colonel) R. H. Firth, R.A.M.C., and Major Horrocks, R.A.M.C.* On the basis of their experiments the authors concluded with regard to flies: "That ordinary house-flies (*Musca domestica*) can convey enteric infective matter from specific excreta or other polluted material to objects on which they may walk, rest, or feed. That such infective matter appears to be attached not only to their heads (mandibles probably),† but also to their legs, wings, and bodies. It has not been proved that the enteric bacillus passes through the digestive tract of the fly."‡

In addition to the already mentioned ways in which flies from latrines may communicate bacilli, that is, either indirectly by polluting food or other objects, or directly by settling on men's mouths, there is yet another possible mode whereby flies infesting a latrine may be dangerous even though they never leave the spot. In a footnote on page 331 of the article from which a quotation has been given above, Major Fred. Smith writes: "An old idea of some Anglo-Indian surgeons was that dysentery could be caught by using the

* "An Inquiry into the Influence of Soil, Fabrics, and Flies in the Dissemination of Enteric Infection." By Major (now Lieut.-Colonel) R. H. Firth, R.A.M.C., and Major W. H. Horrocks, R.A.M.C. (From the Hygiene Laboratory, Army Medical School, Netley.) *British Medical Journal*, September 27, 1902, pp. 936-943.

† By the term "mandibles" the authors doubtless mean the *proboscis;* the house-fly and its allies are destitute of mandibles.—E. E. A.

‡ *Loc. cit.*, p. 941.

same latrine as a dysentery patient. There may be something in this. Experiments on animals have shown that the disease can be inoculated *per rectum.* The ubiquitous fly may therefore be a dysentery inoculator in open camp latrines." This suggests the possibility of the similar conveyance of enteric bacilli by flies infesting such latrines as are being used by incipient or ambulant enteric cases. In the opinion of the present writer, many cases of intestinal myiasis at home, due to the larvæ of flies belonging to the genus *Homalomyia* (*H. canicularis*, Linn., and *scalaris*, Fabr.), are probably to be traced to the parent flies having oviposited on the anus when the patient has been using some country privy where these flies are common.

We may now pass to the consideration of the characteristics, life-history, and general bionomics of the commonest latrine-haunting flies, which in spring and summer were to be met with in myriads in any standing camp in South Africa during the late campaign. All three species selected are abundant in South Africa, but the house-fly is equally common in India, where other species of *Pycnosoma*, the second genus mentioned, also occur. The life-history of the house-fly may be taken as typical of that of the other species.

Musca domestica, Linn. (The Common House-Fly. Fig. 1.)

Musca domestica, Linnæus, Fauna Suecica, Ed. II. (1761), p. 453, 1833.

The following is a brief description drawn up from *British* specimens:—

Length, 6 to 7 millimetres; expanse of wings, extended at right angles to body, 13 to 14⅗ millimetres; individuals which have been stunted owing to insufficiency of food in the larval state may be below these dimensions.

Colour, mouse grey, the sides of the basal half of the *abdomen* in the male, and frequently in the female, also ochraceous buff; *thorax* marked with four narrow longitudinal black stripes, sharply defined at least in front; apical portion of abdomen with a yellowish shimmer; *eyes* narrowly separated in the male by a black frontal stripe, scarcely one-fifth of the total width of the head, but in the female separated by a space of which the width is nearly equal to one-third of the transverse diameter of the head; sides of the front anteriorly in both sexes shimmering silvery yellow or golden yellow; *wings*, hyaline, yellowish at the base, totally devoid of markings; *legs* black.

Homalomyia canicularis, Linn., another fly which is very common in dwellings, is in Europe frequently mistaken for the true house-fly, to which, especially in the male sex, it presents

a certain superficial resemblance owing to the fact that in that sex it also possesses ochraceous-buff-coloured lateral patches at the base of the abdomen. *H. canicularis*, however, may at once be distinguished from *M. domestica* owing to its smaller size, narrower shape, and the fact that the fourth vein runs straight to the tip of the wing instead of being bent up at an angle as in *Musca*. It is sometimes supposed by the uninitiated, who notice the general similarity between the two species and also the difference in size, that specimens of *Homalomyia canicularis* are "young house-flies," which have still to grow to their full size. In view of such a misconception it may therefore be not entirely superfluous to point out that the *larval stage* is the period of growth in insects, and that, apart from the mere expansion of tissues on emerging from the pupa or chrysalis, or after the final ecdysis in the case of forms with an incomplete metamorphosis, no insects grow after attaining the perfect state. A marked difference in size between individuals is therefore due either to variation, and a possible insufficiency of food in the case of the smaller insects when in the larval state, or else points to the presence of more than one species.

It may be of interest to remark that in Europe *Homalomyia canicularis*, Linn., and the closely allied *Homalomyia scalaris*, Fabr., are not without importance to the medical practitioner, since it is the larvæ of these species that are responsible for the majority of the cases of intestinal myiasis, which are of by no means infrequent occurrence. Instances in which the larvæ have been discharged *per urethram* have also been met with, though more rarely. Of intestinal myiasis in which larvæ of *Musca domestica* were concerned only a single case has as yet come within the writer's experience; in this instance larvæ of the common house-fly, accompanied by those of *Homalomyia canicularis*, were voided from the rectum of a child of seven months.

There is probably no insect which is more widely distributed than the common house-fly at the present time, and there can be no doubt that it has been carried all over the world in ships. The British Museum collection, though very far from complete, includes specimens from the following localities: Cyprus; North-West Provinces, India; Wellesley Province, Straits Settlements; Hong Kong; Japan; Old Calabar, Southern Nigeria; Suez; Somaliland; British East Africa; Nyassaland; L. Tanganyika (*Captain Speke*); Transvaal; Natal; Sokotra; Madagascar; St. Helena; Madeira; Nova Scotia; Colorado; Mexico; St. Lucia, West Indies; Pará, Brazil; Monte Video, Uruguay; Argentine

Republic; Valparaiso, Chili; Queensland; New Zealand. It is evident that the insect possesses the power of adapting itself to its environment in a remarkable degree. While it abounds in the Tropics, high latitudes present no obstacle to it, for we are told by Linnæus (*loc. cit.*) that, although rare in Lapland, it swarms in houses in Finmark, about half of which lies within the Arctic Circle ("rara avis in *Lapponia*, at in *Finmarchia Norwegiæ* integras domos fere replet"). Inside a dwelling-house the writer has never seen house-flies in such multitudes as some years ago in a house near Pará, in Equatorial Brazil; at the mid-day meal they swarmed on the table in almost inconceivable numbers, and every helping of food was covered over with an inverted plate in order to protect it. In South Africa during the late war house-flies were extremely abundant in March, 1900, on the banks of the Orange River at Zoutpansdrift, near a spot where the horses of a detachment of the Scots Greys had been picketed shortly before. They were also very numerous in the tents of a camp outside Pretoria in September and October. At night the insects would remain motionless and apparently asleep on the tent-linings, and it was noticeable that if disturbed by the tent being touched they invariably flew against one's face as if still half asleep or unable to see where they were going. At meal-times in this camp, as has already been mentioned, the house-flies were reinforced by strong battalions of the bulkier green-bodied flies of the genus *Pycnosoma*, described and illustrated below. As regards Cape Colony, the swarms of house-flies which infested houses near the Karroo one hundred years ago, and the method adopted for their capture, are described by the German traveller Lichtenstein in his account of his wanderings in South Africa in the early years of the last century.*

Although so excessively common in the perfect state, the house-fly is less well known as regards its preliminary stages than are many other insects which are far less numerous in individuals, and in Great Britain, at any rate, its larvæ are rarely seen. The best account of the life-history of the common house-fly is that published thirty years ago by Packard; † a more recent description is that of Howard.‡ The following *résumé* is based on the statements of both these authors.

* Hinrich Lichtenstein, "Reisen im südlichen Africa in den Jahren, 1803, 1804, 1805, und 1806." C. Salfeld, Berlin, 1811. Pp. 192-193.

† A. S. Packard, jun., M.D., "On the Transformation of the Common House-Fly, with Notes on Allied Forms," *Proceedings of the Boston Society of Natural History*, vol. xvii., February, 1874, pp. 136-150, Plate 3.

‡ L. O. Howard, "House-Flies" ("The Principal Household Insects of the

Oviposition.—The female fly lays about one hundred and twenty eggs, which are deposited in masses in crevices in horse-dung. In colour the egg is dull chalky white, and in shape "elongate oval cylindrical, a little smaller, more pointed at the anterior end than the posterior. It is ·04 to ·05 inch long, and about ·01 inch in diameter" (Packard). According to Packard, whose observations were made at Salem, Mass., the egg hatches in twenty-four hours; Howard, working in the more southerly locality of Washington, found that the egg-stage lasted but one-third of that time. Packard notes that heat and moisture are evidently required for the normal development of the larva, "as usual in all insects." In hatching, the egg-shell probably splits longitudinally, as in the case of the egg of *Calliphora erythrocephala*, Mg. (the common blow-fly).

Larva (fig. 2).—The larva of the house-fly is a white footless maggot, of the type of that of the blow-fly, known to roach-fishers as a "gentle." During its life the skin is moulted twice, so that the period of larval existence is divided into three stages. The *first stage* is distinguished from the other two by the possession of only one pair of stigmata (respiratory apertures), which are situated on the posterior surface of the last segment; the duration of this stage is about twenty-four hours. In length the newly hatched larva measures ·07 inch. The *second* and *third stages* do not differ from each other in any important respect except size. Fig. 2 shows a much enlarged view of the larva in the *second stage*. On the assumption of this stage, *i.e.*, after the first moult, the larva is found to be provided with a second (anterior) pair of stigmata, situated on the prothoracic or first post-cephalic segment. The larva is now much more slender than in the first stage, and has increased in length to ·15 or ·17 inch; the duration of the *second stage* is about twenty-four hours. The *third stage* (from the second moult to the assumption of the pupal state) lasts for three days (Howard), or for from three to four days according to Packard; thus the total duration of larval life is from five to six days. The larva of the house-fly consists of twelve segments; in shape (second and third stages) it is slender and conical, gradually increasing in width to the terminal segment, which is square behind and bears the posterior stigmata situated in a very slight depression. The posterior stigmatic plates

United States," by L. O. Howard and C. L. Marlatt). Bulletin No. 4, New Series, Revised Edition. United States Department of Agriculture; Division of Entomology. Washington: Government Printing Office. 1902. Pp. 43-47; with figures.

are roughly semi-circular in outline, their inner margins being somewhat flattened. According to Packard they are black in colour; under a lens, however, they appear tawny rather than black, with a narrow black chitinous border (the peritreme), just inside the inner straight margin of which is a small black spot—the primitive spiracle of the first stage. The shape of the openings in each posterior stigmatic plate affords a ready means of distinguishing the larva of the house-fly; they are in the form of two very sinuous fissures, the adjoining ends of which, however, are separated by so narrow an interval that under anything but a very close examination they appear to be continuous. In each posterior spiracle of the blow-fly larva the fissures are three in number and straight. The spiracles on the prothoracic segment of the larva of *Musca domestica* are each divided into six or more, rarely eight, lobules.

The conical fleshy *head*, from which the tips of the black horny mouth-hooks can be seen projecting, is about half the length of the prothoracic segment in the larva of the second stage, but proportionally much smaller in the full-grown maggot. On the ventral side of the body, on the dividing lines between the segments commencing with the divisions between the fourth and fifth, there are thickened ridges bearing minute spinules, by the aid of which and the mouth-hooks the larva is able to crawl. In length the full-grown larva of the house-fly measures from ·25 to ·40 inch. The food of the larva consists of the decaying matter in horse-droppings, the bits of hay and straw being left untouched; if hard pressed for food, larvæ may devour each other.

Pupation takes place comparatively suddenly, and is not preceded by any decided contraction or change of form. The puparium, or pupa-case (fig. 3), is of the usual barrel-shape and dark red colour common to the majority of Muscidæ, and consists of the chitinised larval integument. The length of the puparium is from ·20 to ·27 inch. In form it is regularly cylindrical, but tapers towards the head from the fifth segment, "the anterior end being distinctly pointed" (Packard). The posterior extremity is strongly rounded, full and obtuse, with the posterior stigmatic plates showing conspicuously like little, black, round, flattened buttons on the end. In this stage the prothoracic spiracles are very minute, and usually exhibit six lobules.* The pupal stage lasts five days

* It may be worth while to note that the larva and puparium of the blood-sucking fly, *Stomoxys calcitrans*, Linn., which also breeds in horse-dung, are remarkably similar to those of *Musca domestica;* in the former, however, the

according to Howard, or from five to seven days according to Packard.

The Imago, or Perfect Insect.—As in the rest of the Diptera of the Sub-Order to which the house-fly belongs, the perfect insect makes its escape from the puparium by forcing off a cap from the anterior end. This is effected by means of the distension with blood of a membranous vesicle, the ptilinum, or frontal sac, which is protruded from the head immediately above the antennæ, so as to form a "bladder-like expansion, trapezoidal in outline, equal in bulk to the rest of the head" (Packard). The newly emerged fly is a curious looking, greyish creature, which keeps constantly distending and contracting the frontal sac as it walks about; the wings are soft and baggy, folded up so as to occupy a very small compass, and as yet quite useless for flight. In a very short time, however, the wings are extended, and with the hardening of their veins become capable of performing their function, while the exo-skeleton of the body and limbs assumes its proper coloration and firmness.

Packard gives the following summary of the life-history of *Musca domestica* :—

"The eggs are laid about 120 in number, and in twenty-four hours the larvæ are hatched.

"There are three stages of the larval state, and consequently two moults.

"The first stage lasts about one day (twenty-four hours).

"The second stage lasts about one day.

"The third stage lasts three or four days.

"The entire larval state averages from five to seven days.

"The pupal state lasts from five to seven days.

"The period from the time of hatching to the exclusion of the imago lasts from ten to fourteen days in the month of August."

Howard points out that development is accelerated by warmth, so that house-flies are most numerous in hot climates. "As we go further south the house-fly becomes more numerous and more troublesome. The number of generations annually increases as the season becomes longer, and with the warm climate the development of the larvæ becomes more rapid." It was found, however, by Packard, that too direct warmth, especially if accompanied by lack of moisture, had a retarding and dwarfing effect.

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posterior stigmatic plates are smaller, rounder, and further apart, and the lobules of the prothoracic spiracles are five in number.

"Those larvæ which were reared in too dry manure were nearly one-half smaller than those taken from the manure heap. For several days the larvæ living in this dry manure did not grow sensibly. Too direct warmth, but more especially the want of moisture, and consequently of available semi-liquid food, seemed to cause them to become dwarfed."

Pycnosoma marginale, Wied. (fig. 4).

Musca marginalis, Wiedemann, Aussereuropäische zweiflügelige Insekten, II. (1830), p. 395.

Length, 9 to 13 millimetres; average wing expanse (with wings at right angles to body), 22½ millimetres.

A thick-set, stoutly built fly, with orange-buff-coloured face, and shining, metallic plum-purple or metallic green body, recognisable at once by the dark brown front border to the wings.

Eyes in male meeting together in the middle line above, in female separated by a cadmium-orange-coloured space (the front), practically equal to one-third of the head in width; male with an area on the upper half of each eye consisting of larger facets than the remainder; *antennæ* orange, the arista and hairs clothing it brown; ground colour of *thorax* and abdomen varying as indicated above; *thorax* with a shimmering, pollinose, transverse band of pearl-grey on its anterior and posterior third, making these areas duller than the remainder, which appears in certain lights as a dark transverse band; *abdomen* with a shimmering, pollinose band on the basal portion of the second segment, and similar lateral patches on the third and fourth segments; first segment and hind borders of second and third segments usually darker than remainder of abdomen; *wings* hyaline, with a dark brown patch at the base, which is continued as a stripe along the fore border to the end of the second vein; *legs* metallic purplish brown or black.

Pycnosoma marginale has a very wide distribution in Africa, and even ranges eastward as far as Quetta; westward the writer has met with it in St. Vincent, Cape Verde Islands. The British Museum collection includes specimens from the following localities: Sierra Leone; Congo Free State; Natal; Transvaal; Uganda; Abyssinia; Somaliland; Sokotra; Aden; Muscat; Quetta.

Pycnosoma chloropyga, Wied. (fig. 5).

Musca chloropyga, Wiedemann, *Zoologisches Magazin*, Bd. I., Stück II. (1818), p. 44; Aussereuropäische zweiflügelige Insekten, II. (1830), p. 400.

Length, 6½ to 10 millimetres; average wing expanse (with wings at right angles to body), 18 millimetres.

Metallic bluish green, or metallic plum-purple, last two segments of abdomen brassy green; wings hyaline, with a dark blotch near the base.

Head in the male with the eyes almost meeting in the middle line above, in the female with the eyes widely separated; lower part of head, including anterior portion of orbital margins, yellowish grey, clothed with short silvery white hair; upper half of front (space between the eyes) in female shining purplish black, frontal stripe deep black; *antennæ* black, arista and hairs clothing it brown; *thorax* marked as shown in fig. 5, the dark areas deep black, the lighter portions metallic plum-purple or bluish green, clothed with shimmering pearl-grey pollen, which is more conspicuous in front; *scutellum* generally more or less dull black at the base, the distal two-thirds shining; *abdomen* with the first segment blackish, and the hind margins of the second and third segments dull black, the dark margin of the second segment often double the depth of that that of the third; shining portion of second segment clothed with shimmering pearl-grey pollen; legs black.

Pycnosoma chloropyga is widely distributed in South Africa, and ranges at least as far north as British East Africa: other species of the genus, very similar to it in size and general appearance, are found in West Africa and elsewhere in the same continent, while yet other species occur in India, China, and the East generally.

When the conditions are favourable to them, the flies of the genus *Pycnosoma* (of which the two species described and illustrated above may be taken as convenient examples) swarm about latrines and filth-trenches in Africa and the East, largely taking the place of the well-known "green-bottle" flies of Europe (genus *Lucilia*), although the latter are also represented. So far as the writer is aware, no one has as yet investigated the actual life-history of flies belonging to the genus *Pycnosoma;* there can, however, be no doubt that they breed in decaying animal and excrementitious matter (latrines), and that as regards the appearance of the larvæ and other details their life-history closely resembles that of the common house-fly.

We have now described what takes place and given some account of the living agents, and it may fairly be asked what is the practical outcome of the present paper? It is one thing to draw attention to admitted facts, and quite another to indicate a remedy, which, moreover, is beyond the province of the writer. Nevertheless, it is earnestly to be hoped that the authorities of the Royal Army Medical Corps will without delay seriously consider the question of

flies and latrines in standing camps in hot climates. Unless this be done, and material improvements in the existing system be effected, it is inevitable that recent experience will be repeated in the next great war in which we are involved, and wastage from enteric fever will continue to the same extent as of old. Most authors who have hitherto touched upon the subject have contented themselves with insisting upon the necessity of promptly burying all refuse, horse-droppings, offal, &c., in which flies might breed, the regular disinfection of latrines, and the covering up of their contents with earth. But all such precautions, although well enough in their way and dictated by common sense, seem to the present writer to be a little beside the mark. Flies there always will be in spite of all precautions in even the best regulated standing camps in hot climates; in camps occupied for one night only by troops on the move there is, of course, less danger, since flies have not time to collect or multiply by breeding. What is wanted, however, is some simple but effective means, adapted to Service conditions, of preventing flies from gaining access for however short a time to the contents of the latrines at all; for it is obvious that if flies are able to visit, even for a minute or two, the dejecta of one ambulant enteric case the mischief may be done. Major Fred. Smith, in the excellent article referred to above, maintains that the orthodox latrine-trench system, "thoroughly carried out," is the best known to him for camps. But he admits that it is "only by constant, wearying supervision that any approach to efficiency" can be maintained, and at best this does not amount to more than a half-hourly covering up and liming of the contents of the trench. This is not enough, and a latrine so tended, admirable as it appears in description by contrast with others met with in South Africa, might still prove a happy hunting ground for flies in the intervals between the visits of the pioneers. Real efficiency, with the resultant saving in the lives of men, can only be obtained by the use of some mechanical contrivance whereby dejecta would be just as completely protected from flies as in the scientifically constructed modern water-closet. A spray-distributing apparatus, by means of which the opening of the trench would be continuously closed against flies by the production of a fine layer of milk of lime or green vitriol in solution, passing uninterruptedly from side to side, would *theoretically* answer the purpose, but, if adopted, would be liable to get out of order, and would inevitably fail sooner or later through lack of water, if from no other reason. Perhaps a more feasible plan would be to issue light metal covers for latrine trenches, provided at regular intervals with apertures closed by

spring flaps, which could be actuated by the feet of the users.* These covers might be issued for service in sections, say six feet long by three feet wide. On soft, level soil they might be expected to answer well enough, but on rocky and uneven ground, spaces would be left by which flies would gain access to the trench. Still it seems to the writer that the idea might be worth trying, unless the genius of sanitary officers or of the Royal Engineers can devise a better plan.

* Should this suggestion be adopted, it would be advisable in addition to provide for the discharge at intervals into the trench of some such fluid as kerosene or crude creolin in solution, which would probably render a latrine less attractive to flies.

LIST OF FIGURES (PLATES I. and II.).

PLATE I.

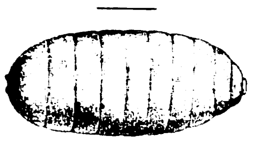

Fig. 1.

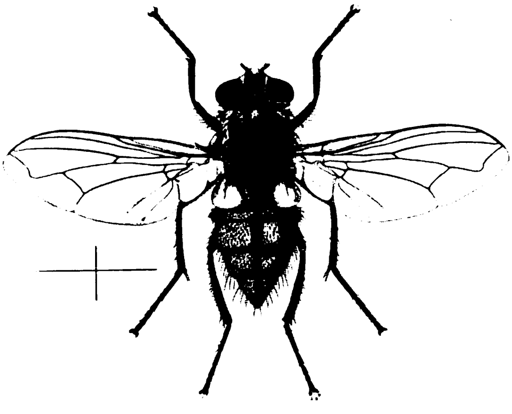

Fig. 2.

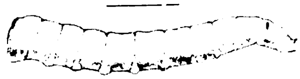

Fig. 3.

PLATE II.

Fig. 4.

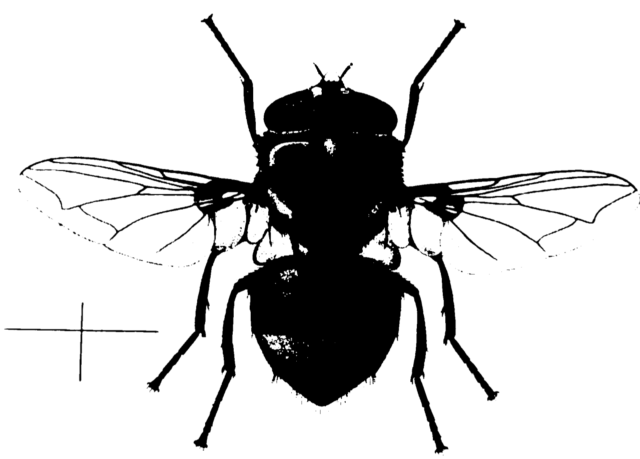

Fig. 5.

NOTES ON ROMANOWSKY STAINING.

By Major W. B. LEISHMAN.
Royal Army Medical Corps.

The method of obtaining rapid Romanowsky staining by a single solution, published by me in the *British Medical Journal* of September 21, 1902, has, I am glad to think, proved of some use in the examination of blood, and especially in the investigation of malaria. Since then I have found it to be of service in several other directions, and partly on this account, partly because the original description of the method is not readily accessible, the following remarks on the extended application of the stain may be serviceable to those who are interested in microscopical technique.

I need not recapitulate the somewhat complicated method by which the solid stain is prepared, as those who wish may refer to my original communication, but there are certain points in the preparation of the solution which are of importance to those who have to make this up for themselves. The solvent for the powdered stain is methyl alcohol, and it is of the first importance that the right quality of methyl alcohol should be used for the purpose, namely, "Merck's" methyl alcohol ("pro analysi, acetone free"). Good results are not to be expected if less pure varieties are employed. The powdered stain is dissolved in this alcohol in the proportion of ·15 per cent., and the following details must be observed in preparing the solution in order to obtain its maximum staining power. The powder should be ground in a clean mortar as finely as possible, and the proper proportion of methyl alcohol measured into a convenient vessel; a little of the alcohol is then poured into the mortar, and the grinding continued for some time. After a few minutes' rest, to allow the undissolved particles to sink to the bottom, the upper part of the fluid is poured into a clean bottle, a fresh supply of the alcohol is added and again rubbed up with the remains of the powder. This process is repeated until the whole of the finely divided powder is in this way dissolved in the proper quantity of solvent. This procedure is rendered necessary by the slight solubility of the powder—·15 per cent. being nearly a saturated solution—and, if not carried out, or if filtration through filter paper is employed, the resulting solution will be unduly weak and the results obtained with it inferior.

The fluid stain prepared in this manner should be kept in a

bottle provided with a tightly-fitting ground glass stopper, and, under ordinary conditions, will preserve its properties unaltered for several months. I have, however, been informed by some of those who have worked with it in the Tropics that it gradually loses its characteristic staining power in a hot, damp climate. I am inclined to attribute this chiefly to the hygroscopic qualities of the methyl alcohol, and such a deterioration may, I think, be avoided by making up only a small quantity of the solution at a time, and by taking strict precautions as to keeping the bottle tightly stoppered, so as to minimise either the absorption of moisture or the evaporation of the alcohol. One of the many patterns of "drop-bottle" is admirably suited for this purpose. It is hardly necessary to add that similar precautions must be observed with regard to the methyl alcohol itself, if this is kept separately.

Before proceeding to the description of the special methods of employing the stain, which forms the chief object of this article, it may be well to recapitulate the mode of using it for ordinary blood staining, though there is little to add to the original description.

Thin, even films of blood are made upon *perfectly clean* cover-glasses or slides and are allowed to dry in the air or by gentle heat. A few drops of the stain are poured upon the unfixed film and allowed to act for fifteen to thirty seconds, by which time the film will be fixed by the methyl alcohol—previous fixation by most of the methods in general use will prevent chromatin staining. Only enough stain should be used to cover the film with a shallow layer, and care must be taken by moving the slide or cover-glass to prevent the stain drying upon any part of the film. At the end of this time double the quantity of distilled water—not more—is added to the stain, and the water and the alcoholic stain are at once thoroughly mixed by shaking or with the help of a needle held parallel to the surface of the glass and passed backwards and forwards through the fluid. When the stain is thoroughly mixed with the water the mixture is left on the film for five minutes, by which time an iridescent scum will have formed on the surface and a fine flocculent precipitate will be seen to have formed. This period of five minutes is ample for all ordinary blood work, such as leucocytic counts and the demonstration of malaria parasites, and the stain must now be gently washed off by pouring on the film a little distilled water. When all the precipitate and stain is washed away a little of the water is allowed to rest on the film for half a minute, as this intensifies the brightness of the colour contrasts of the various cells, and advantage may be taken of this moment to glance

at the film with the $\frac{1}{6}$ inch lens to make sure that the Romanowsky chromatin staining is deep enough. The dense nuclei of the polynuclears or lymphocytes form the best index of the depth of staining, and should appear of a deep purplish red or ruby colour. If these are seen to be too light in tint, as may happen with old or bad films, the stain may be reapplied as before until the proper density of nuclear staining is attained.

For certain special work, as, for example, the demonstration of Schüffner's dots in the red cells infected by the parasites of benign tertian malaria, or of Maurer's dots in the cells infected by young segmenting forms of malignant tertian malaria, a deeper degree of chromatin staining may be required. Here all that is necessary is to increase the length of time for which the mixture of stain and water is allowed to act, and it will be found that the deepest coloration possible is attained after a maximum period of one hour. In specimens which are to be submitted to this very deep staining it is well also to take a little extra trouble to procure a perfectly clean glass surface on which to spread the film, and any of the methods employed for cleaning slides or cover-glasses for flagella staining will answer this purpose. In all cases the depth of staining may be observed and controlled by examination from time to time under the microscope without the staining fluid being removed from the surface of the film by using as a gauge the coloration of the nuclei of the leucocytes, which will be observed to change from pale blue, through dark blue, purple and ruby red, to the deepest black, according to the length of staining. In specimens which require staining for more than ten minutes it is well to check evaporation by covering them with a watch glass or the lid of a Petri dish.

Occasionally, and more especially in films which have been stained for the longer periods, or in those in which the surface of the glass has not been perfectly cleaned, a certain amount of granular deposit may be found on the films. This may usually be got rid of by a quick wash in absolute alcohol, a few drops being allowed to run over the film, which is then, after a few seconds, plunged into distilled water to stop the decolourising effect of the alcohol.

If the red blood corpuscles appear bluish instead of pink, as sometimes occurs in old films, the pink colour may be restored by washing the film in a very dilute acid solution, such as acetic acid of a strength of 1 in 1,500.

The film should now be roughly dried with filter paper and completely dried in the air. Heat, which would break up the stain

and decolourise the chromatin, must on no account be employed for this purpose. The specimen when dry is then ready for examination directly in cedar-wood oil, or it may be permanently mounted in zylol balsam in the usual way.

The colour reactions of the various blood cells to Romanowsky's method are, I fancy, pretty well known now, so I shall not describe them, but will pass to the application of the stain for special purposes other than those of a simple blood examination.

I feel sure that there are many who are deterred from taking up microscopical work in pathology by the complicated material and apparatus which they would gather to be necessary from most of the text-books on the subject and it is chiefly on this account that I have endeavoured to make this stain serve other purposes than that of simple blood staining. The fewer the tools the busy workman has to use the more familiar will he become with their use and the more rapidly will his work be accomplished. A reduction in the amount of the impedimenta which must be carried about is also a point whose value we in the Service know well.

Briefly, the stain in question may further be employed as a bacterial stain, as a stain for the various parasites found in the blood and the tissues, for pus and other cellular exudations, for smear preparations from the various organs, and, finally, as a differential stain for sections; and I will now proceed to describe the method of employing it for these purposes.

Bacterial Staining.—Films of bacteria, prepared in the usual way, are quickly and easily stained by following the technique laid down for blood films. Fixation of the film may be done by flaming in the usual way, or may be left to the fixative action of the methyl alcohol. The bacteria may be stained to any desired depth of colour by prolonging the process, as in blood staining, and they come out very clearly and sharply defined. As the stain is not a very opaque one it is particularly useful for demonstrating the finer structural details of the bacterial cells, such as the segmentation of the diphtheria bacillus and the bipolar aggregation of the protoplasm of the plague bacillus. In the staining of films from broth cultures there is the further advantage that previous clearing of the film with acetic acid may be dispensed with. I should like further to point out that by staining well-made bacterial films for half an hour, and subsequently washing them in absolute alcohol for fifteen to thirty seconds, a differentiation of colour is produced in most bacteria, and a small mass of chromatin can be seen in the cell, contrasting brightly, by reason of its red colour, with the pale

blue of the partially decolourised protoplasm. The study of the shape and disposition of these chromatin bodies in the bacterial cell is one of great interest, and it appears from the work of various German and Japanese authors that this arrangement is a fairly constant one for a given species; and I would suggest it as a profitable field of study for any who may care to follow it up as a possible means of distinguishing morphologically between closely allied bacilli. In my hands it has yielded some very interesting results in studying the changes which bacteria undergo under cultivation. Deep staining of bacterial films containing spores also brings out an appearance of a dark-purplish capsule surrounding the spores, which helps to distinguish these bodies from others which simulate them: the spore itself is unstained.

Malaria.—For simply demonstrating the presence of parasites of all forms the technique described for ordinary blood work amply suffices; by it the protoplasm of the parasite stains blue and the chromatin a bright ruby red colour, the melanin granules, of course, retaining their natural black or brown colour; but recent advances in our knowledge of these parasites necessitate the demonstration of certain changes in the red corpuscles which contain the parasites, and this demands usually a greater degree of intensity of the chromatin staining.

(1) Schüffner's dots in the red cells infected by benign tertian parasites. These are frequently demonstrated in freshly prepared films by five minutes' staining in the ordinary way, but to make certain, it is better to stain for ten to fifteen minutes. Only in very old or in badly prepared films have I known this to fail.

(2) Maurer's dots in the red cells infected by malignant tertian parasites. To demonstrate these necessitates the highest grade of staining, and the method described above should be employed for one hour. This is not the place to describe the appearance and significance of these dots, but I would remind those who seek to stain them, that they are only to be met with in the cells infected by young segmenting forms, and only when these have attained a certain stage of maturity, and, further, that these are only to be met with in the peripheral blood at certain stages of the fever.

(3) Capsulated crescents. As in the case of Maurer's dots, these, too, require one hour's staining to show the deep red capsule formed by the shrinkage of the host cell round the crescent, and in this case special care must be taken not to allow the film to soak too long in water, as these capsules are readily discoloured. I have

elsewhere suggested* that the staining reaction of these capsules may eventually prove to be a means of subdividing malignant tertian malaria into two kinds, and thereby reverting to the view which, at the present moment, has been largely abandoned in favour of that of the unity of all forms of crescent malaria.

Speaking generally, most of the recent advances in our knowledge of the structure and life-history of the malaria parasites have been due to the employment of some method of deep Romanowsky staining, and, as these methods have only been systematically employed by a few observers, it is not too much to hope that we may yet learn much from its more general use.

In connection with malaria there is another method, associated with the name of Ross, for demonstrating the presence of parasites, when these are few in number, by dissolving out the hæmoglobin from a thick unfixed film of blood, and subsequently staining by a modification of Romanowsky's method. My stain may be employed for this purpose in the following way. A thick blood film is made on a clean slide and allowed to dry in the air, one part of stain and two parts of water are mixed in a watch glass, poured on to the unfixed film, and allowed to act for five to ten minutes. The rest of the procedure is the same as described for ordinary blood work, except that only the gentlest force should be employed in washing the stain off, and that drying should be done in the air and not by blotting with filter paper. In the result, the parasites and leucocytes are seen stained each in their characteristic fashion, while only the "ghosts" of the red corpuscles are dimly visible. Personally, however, I do not like this method of working with thick films, as so much distortion of the parasites is caused that little detailed information can be gathered from them, and I prefer to stain an ordinary *thin* film in the above manner; one can then detect parasites with great ease, even when very few in number, as they catch the eye at once, while, at the same time, as no distortion of their shape has taken place, the finest details can readily be made out. In this way we learn from a single examination not only that malaria parasites are present, which is usually all that can be gathered from the thick film method, but also the variety of the parasite and the stages in its life cycle which are represented.

Piroplasma.—These parasites are demonstrated precisely in the same manner as malaria parasites, and show the same staining

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* "Proceedings of the Pathological Society of London," *British Medical Journal*, March 19, 1904.

reactions, viz., protoplasm blue and chromatin red. I have not had many opportunities of studying the effects of deep chromatin staining on these parasites, but the containing red cell does not appear to show any change corresponding to Schüffner's or Maurer's dots.

Halteridium, Drepanidium and *Proteosoma*.—Stained as for malaria.

Filaria.—Filarial embryos, such as *Filaria sanguinis hominis* and the embryos of the guinea-worm, stain well when dried on slides in the ordinary method, the best results being got by staining for fifteen minutes and subsequently washing rapidly in alcohol. By this means a considerable differentiation of structure, not readily observed with most other staining methods, can be made out. No separate process of fixation of the film containing the embryos is necessary.

Trypanosoma.—Stain as for malaria parasites for ten to fifteen minutes, controlling the depth of staining by examination under a low power while the film is soaking in water. To bring out all the details of their structure rather deep staining is necessary, and the film may be allowed to soak in water for a little longer than usual. When treated thus, the macro-nucleus appears red, the micro-nucleus black, the flagellum red, and the basophile granules black, while the protoplasm of the parasite is coloured blue. When the parasites are very few in number the method described in connection with malaria, by dissolving out the hæmoglobin of the red cells, may be employed with advantage.

"Dum-Dum" Parasites.—Stain for the same length of time as for malaria parasites. The large and small chromatin masses stain deep red, and the circular or oval protoplasmic body a very pale blue colour.

Spirillum Obermeieri.—Deep staining is necessary to get satisfactory specimens of these delicate little threads, whose relation to the trypanosomata has just been shown by Schaudinn.* The results are, I think, clearer, and the film cleaner, than when the more usual stains, such as carbol fuchsin, are employed.

Bacteria in Blood.—Readily and clearly demonstrated by the usual method employed for blood films.

Pus, Sputum, &c.—Spread in thin, even layers, and treated as though they were blood films. Any bacteria present, whether intra- or extra-cellular, stand out sharply and clearly.

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* *Arbeiten aus dem Kaiserlichen Gesundheitsamte*, vol. xx., part 3, 1904

"Smear Preparations" from Glands, Organs, Morbid Growths, &c.—This method of examining the tissues is, I think, of the first importance and, when the material is fresh, yields information which can be obtained in no other way. Good staining of chromatin can only be secured in fresh specimens, as portions of the tissues which have been hardened and embedded for section cutting are so altered chemically that the characteristic chromatin reaction is lost, and with it all the valuable information which may be gathered from its presence and arrangement. The importance of this is obvious, as so much of our knowledge of the varieties and stages of life of parasites such as those of malaria depends upon the quantity and disposition of their chromatin. When, however, we make "smears" from fresh tissues containing these parasites the results obtained are equal to those of the best blood preparations, and the knowledge that has been gained in this way is considerable. So many stages of parasitic life are seen chiefly or solely in the internal organs that, if this means of examination had been neglected, our knowledge of their cycles of development would be very incomplete, and rich as have been the results obtained in this way, whether by puncture of the organs or tissues *intra vitam*, or by examination immediately after death, I am convinced that many valuable discoveries will in the future reward the systematic exploitation of this method of investigation. Little need be said as to the method of carrying it out, staining being conducted in a manner similar to that of blood films. Three precautions must, however, be observed—the slides must be perfectly clean, the film must not be too thick, and the material must be smeared over the glass very gently to obviate mechanical distortion of the cellular elements of the tissues.

Section Staining.—In my original communication on this stain I mentioned its probable value as a selective stain for sections of the tissues, but for a long time I was unable to obtain results as good as I had hoped; further experiment has, however, been more satisfactory, and the method described below, after a little practice, may, I think, be relied upon to give good and regular results. The method is extremely simple, and the purposes it may be made to serve are many. The differential staining of the tissues is clear and suffices for all ordinary histological work, such as the examination of new growths, while for the detection of bacteria and parasites in the tissues it has, I think, certain advantages over the more complicated methods usually employed.

Before describing the technique I should like to say a word in

the hope of popularising this method of microscopical research among our Corps. At present, as I have reason to know, many are only deterred from personally undertaking such work on account of the elaborate outfit and the special knowledge which they conceive to be necessary. If, however, we except some form of microtome—and very serviceable instruments are to be had at quite a moderate cost—the rest of the outfit for section cutting and staining need only occupy little space and involve quite a small expense, especially as much of the material required may be obtained from the hospital pharmacy. The processes of hardening and embedding pieces of tissue for section cutting are of the simplest and purely mechanical, while proficiency in the actual cutting of sections demands only the time to familiarise one's self with the particular microtome at one's disposal. The technique of the fixing, staining and mounting of sections, if no longer fresh in one's memory, is readily recalled with the help of one of the innumerable handbooks on the subject, and I am certain that those who undertake such work would in a surprisingly short time find themselves well repaid for their trouble. There is so much waiting to be worked out in tropical pathology, and, as our Editor reminded us the other day, we as a Corps have unrivalled opportunities for profitable investigation.

The general principle involved in the application of the stain in question for colouring sections is that, by the procedure indicated below, the chemical compound which constitutes the stain is broken up into its original components—eosin and methylene blue—and by this means a colour contrast of the tissues is obtained by reason of the different affinities of the basic and acid elements of the tissue for these two stains. Practically the same effect may, it is true, be obtained by staining with solutions of these dyes separately, but this process is, in comparison, longer and more complicated, and the results, even in experienced hands, are often unsatisfactory. The economy of time and material, the use of one stain in place of two or more, the clear nuclear staining, and the facility with which bacteria and parasites are detected are the chief advantages which I think may be claimed for the method which I shall now describe.

The section, fixed on a slide and freed from paraffin, if it has been embedded in this material, is allowed to soak in distilled water to remove all traces of the alcohol which has been employed to get rid of the paraffin solvent, zylol, or benzine. The excess of water is drained off and a mixture of stain and distilled water, in the usual proportion of one part of stain to two of water, is poured from a watch glass on to the section. The slide is then tilted backwards

and forwards to ensure intimate mixture of the staining fluid with the water already resting on the section. Staining is now allowed to go on until the section appears of a deep Oxford blue colour, which will usually take about five to ten minutes, and the stain is then washed off with a little distilled water. The next step consists in a partial decolourisation of the overstained section by means of a very weak acid solution, and for this purpose acetic acid, of a strength 1 to 1,500 of water, answers well. A few drops of this are poured on to the section and its decolourising effect controlled by watching the process under the $\frac{2}{3}$ inch lens. By degrees the deep blue colour begins to come out and its place is taken by the pink tinge of eosin element of the original stain. The process is continued until it is seen that only the nuclei of the tissue cells retain the deep blue tint and, to the naked eye, the section appears generally pink with only a slight blue mottling, the amount of this mottling depending upon the richness or poverty of the tissue in cellular elements. When this point is reached decolourisation is sufficient, the acidulated solution is washed off with distilled water and the section is ready for dehydration, clearing, and mounting. Occasionally, if the section is thick, or consists of a tissue exceptionally rich in eosin-staining elements, the density and opacity of the pink tinge may be too great and might mask the finer details of the blue-stained elements, such as bacteria; in this case a very weak alkaline solution, such as caustic soda of the strength of 1 to 7,000 of water, may be used after the acid decolourisation; this is dropped on to the section and its action in lightening the pink tinge is watched under the microscope and finally checked by distilled water, precisely as in the case of the acid solution. This latter process is, however, rarely required, and the action of the acid solution alone suffices, as a rule, to produce the desired result. It is to be noted that these weak acid and alkaline solutions should not be older than two to three weeks, as they gradually lose their strength.

The section is now ready for the usual dehydration and clearing, and it is of importance, if the best results are to be obtained, that throughout these processes it should never be allowed to dry, since if this happens a certain amount of shrinkage of the tissue will occur which will mar the outlines of the more delicate structures. By holding the slide in one hand, tilted over a dish, and dropping on to it in succession the various fluids, these follow and displace one another, the section remaining moist throughout. Dehydration is best done by a few drops of absolute alcohol, and this should be very rapidly followed by the zylol or benzine used

for clearing. It is well to remember that the acetic acid decolourisation should stop a little short of the point aimed at, as in the dehydration by alcohol, however rapidly carried out, a little more of the blue colour is taken out. When the clearing is complete and the section looks perfectly transparent the zylol is allowed to run off, and when it is just upon the point of completely evaporating from the tissue a drop of Canada balsam is allowed to fall on the section, a cover-glass is applied, and the process is finished. The whole operation can be completed in about ten to twelve minutes.

When stained in this way the nuclei of the tissue cells and leucocytes are coloured blue and the rest of the tissue a pale transparent pink, while a very clear differentiation of structure is obtained. Any bacteria present in the tissue are sharply stained and bright blue in colour, and when aggregated into clumps or colonies, as in the case of a typhoid spleen, such clumps are easily detected by means of their bright blue reaction, even with a $\frac{2}{3}$ inch lens. The decolourising effect of the acetic acid is less upon bacteria than upon most cell nuclei, so there is little risk of their being overlooked if the depth of nuclear staining is controlled as described above, and the method is particularly applicable where the germs for which search is being made do not stain by Gram's method.

Many of the tissues show somewhat different colour reactions, which serve to differentiate them from other tissues; for instance, voluntary muscle fibres take a purplish tinge, which appears to me to be constant and characteristic, but space forbids my describing these in detail, and I will only mention a few points which appear to me of interest.

Malarial Parasites in Sections.—Sections of brain, spleen, liver, intestine, &c., containing malignant tertian parasites give excellent results, the bright blue protoplasm of even the youngest forms showing up clearly against the pink tint of the containing red cell, while in the mature rosettes the number of merozoites can be read with ease where the cells are not too closely aggregated. The chromatin, as I have already mentioned, is not stained, but with this exception the details of the parasites can be studied almost as well as in blood films.

Actinomyces bovis in Sections.—I mention this because of the curious colour reaction of the characteristic club-shaped swellings at the ends of the filaments. These stain uniformly pink, while the mycelial network is blue, showing, I think, their nature as swellings of the capsule of the filament. The effect of this in a section of the tongue of an ox affected with actinomycosis is to

produce an appearance of bright red specks on a blue ground, readily made out with a hand lens.

Bacterial Capsules.—In some instances bacteria which do not show capsules under ordinary conditions exhibit a marked pink capsule surrounding the blue bacillus; this has been noted chiefly in sections containing anthrax bacilli.

In conclusion, I would point out as a possible saving of labour to those who may wish to try this staining method, that in the event of the colouration of a particular section not proving satisfactory the specimen need not on that account be discarded, but may be stained afresh by using in succession (1) zylol, to dissolve out the Canada balsam; (2) alcohol, to remove the zylol and decolourise the specimen; and (3) distilled water, to wash out all traces of the alcohol. Such a procedure takes much less time than would the preparation of a fresh section, and the ultimate result is in no way prejudiced.

May I add that it would give me the greatest pleasure if I could be of assistance to any who may wish for further information upon the subjects of this article?

MAUSER BULLET WOUNDS OF NERVES—A SURPRISING LESION.

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In the late war in South Africa lesions of the nerve trunks seemed by far the commonest of all complications of Mauser bullet wounds, as they undoubtedly were one of the chief causes of invaliding home for wounds received in action.

This prevalence, as compared with that of former wars, was, of course, only apparent. It was due to the fact that the ordinary Mauser wound healed by first intention; and, as a consequence, the more slowly recovering nerve was left a long way behind the other tissues, so to speak, in the race for repair. Thus the nerve lesion came very prominently into notice, even in those cases where graver, if less lasting, complications existed as well.

What struck one most, perhaps, about these nerve lesions—as met with at a General hospital—was the incompleteness of the paralysis in the parts supplied below the site of injury, either as regards sensation or motion, or both. For my own part I can say that, in aseptically healed normal Mauser wounds, I did not see a single case in which some part or other of the nerve below the lesion did not retain its normal function. Consequently, although it would seem that others have met with complete division of the nerve in such a bullet track, I am inclined to think that this condition must be extremely rare. The following three cases, given in detail, in which nerves were actually seen to have been perforated by bullets of much larger diameter than the nerves themselves, go far to bear out this view; while the degree of recovery of function eventually attained in them may afford some satisfaction as well as interest to those who, like myself, saw little or no improvement take place in nerve lesions generally, during the few weeks they remained under our observation in South Africa.

Here I would remark that, while some authors who have contributed to our knowledge of Mauser bullet wounds in this war allude to the possibility of nerve perforation, they do not give any details of cases. This omission is all the more unfortunate, inasmuch as the lesion is evidently quite new in military surgery. At least, if it existed in former wars, it seems not to have been noticed, though apparently its existence was not even suspected.

So that, although, as will be seen further on, there are some grounds for believing that this must have been a rather common nerve lesion in the recent war, I can find no case recorded other than those given here, which came under my own observation very early in the war, in which, on exploration, the perforation was actually seen.

No doubt, subsequently, there were some cases noted by other surgeons in which the great sciatic, and even the internal popliteal nerves were found traversed by scar tissue in such a manner as to suggest to them perforation by the bullet. But with such large nerves the condition would naturally not occasion much surprise. It is a different matter altogether when nerves of smaller diameter than the bullet are so perforated, instead of being cut right across, as one would expect. It is this class of cases that provides food for reflection, and that makes the lesion one of the most interesting, perhaps, to be met with in modern military surgery.

CASE 1.—Pte. A., Bethune's Mounted Infantry, wounded at Tugela River, January 15, 1900; transferred to No. 4 General Hospital, Mooi River, seven days later. Entrance (normal Mauser) in front, half an inch above centre of axillary fold; exit in kink of posterior axillary fold; both small and healed by scab. Drop-wrist, but triceps not paralysed, nor sensation entirely lost on backs of fingers.

Operation undertaken to repair the nerve January 26, eleven days after receipt of wound. Incision made across axilla and bullet track, in the line of the main artery. In following, with the finger alone, the musculo-spiral nerve, as it wound under the artery, it was found glued to the latter, in the bullet track, by a small, tarry-looking blood clot, the disturbance of which gave rise to profuse hæmorrhage. There was a rent found here in the axillary artery half an inch long, where it had been adherent to the nerve—the vessel was on the stretch now, with the arm drawn from the side. The artery was tied above and below, and divided between the ligatures. When the divided ends retracted, a small round perforation in the underlying nerve came fully into view. It was only just big enough to allow the blunt end of the ordinary pocket-case silver probe to drop through, and was occupied by blood clot previously. On cleaning up the traces of clot, the sides of the nerve were seen to be sound, and in continuity. The perforation in the nerve was partly punched out, though the edges were contused, leaving some severed and frayed ends of nerve fibres above and below, and it involved about one-third of the diameter of the nerve

trunk. The question now arose as to whether we should approximate these divided fibres, by hitching up the nerve with a suture or two, placed vertically across the opening, or leave things alone. As it would be a matter of some delicacy to remove the contused parts only, and as it seemed that the sound parts of the divided fibres could not be more than a quarter of an inch apart, the latter alternative was adopted. The nerve was merely cleaned, and replaced in its bed, and the wound closed. Healed by first intention; wrist-drop improving slowly, under massage, when, fifty-one days later, patient was invalided to England. At Netley, June 7, one hundred and forty-four days from receipt of wound, the official record says, "musculo-spiral paralysis has disappeared." Patient then went to America, and, in answer to my enquiry, I received a letter dated California, February 15, 1904. He says that he has perfectly recovered, that previously, when he was in a colder climate, his hand used to become a little numb at times, but not now, and adds, "I can hardly tell that my hand was ever crippled at all."

CASE 2.—Sergt. X., admitted to No. 4 General Hospital, Mooi River, January 24, 1900, about a week after receipt of wound. A normal Mauser bullet had traversed the middle of the arm, crossing in front of the humerus. Wounds had healed by scab, but "there was numbness in all the area supplied by the median nerve, though the numbness was not complete. The muscles supplied by this nerve were weak and sluggish in action, but not actually paralysed."

On January 29,—about ten days after being wounded—Mr. F. R. Martin (now Captain S.A.C.) made an incision across the cicatrix, in the course of the nerve. The nerve trunk was found pierced in the track by the bullet, just as in the former case. The perforation was central, and admitted a large sized probe. The nerve was replaced in its bed, without further interference, and the wound closed. Healed by first intention; when invalided to England two months later "it was doubtful if any improvement had taken place." Now (1904) serving; Lieut. Ievers, R.A.M.C., says "great improvement . . . finger joints are not stiff . . . no cicatrix to be felt in bullet track," but it appears that he has not yet quite recovered, from the further remarks: "there is some wasting of the small muscles . . . says he cannot clench his fist."

Remarks.—These are, it seems, the first cases of nerve perforation by a bullet on record, and lest there should remain any doubt in the reader's mind, as to the correct interpretation of the condition seen, I would add, that, in each case, we made a very careful examina-

tion of the bullet-track, in relation to the nerve. Mr. Sidney Hulke, and Mr. F. Pope assisted in the first case, and, at both operations, there were many other officers present, who were no less astonished at this peculiar lesion than we were. How the Mauser bullet makes its way through a nerve trunk that is not more than half its diameter was, and still is, a puzzle.

This observation, however, so early in the war, prepared us, I think, for the similar, and scarcely less curious perforations which we afterwards met with in blood-vessels, as well as for the trifling symptoms that followed perforating Mauser wounds of the contents of the chest, abdomen, and even cranial cavity, in quite a large proportion of the cases.

It can only be surmised, either that the nerve spreads out like a ribbon on impact of the bullet, or that, on account of the conical shape of the Mauser point, it partly splits up the nerve trunk. The latter assumption seems negatived by the next case, which was not due to a Mauser, but to the ordinary Service pattern revolver bullet, with blunt leaden nose.

Case 3.—Sergt. M., wounded January 24, 1900; transferred to No. 4 General Hospital, Mooi River, nine days later.

Entrance one and a half inches above, and a little outside, internal condyle of left arm; no exit, but a short and thick bullet seen by X-rays to be lying over deltoid muscle—a long raking wound of arm, due to his revolver going off accidentally. Tense hæmatoma all over arm; œdema of forearm and hand; partial anæsthesia of median supply, but the flexor muscles appeared to be unaffected.

On February 5, twelve days after injury, we cut down on the brachial artery by a rather long incision, as, from the very oblique course of the bullet and great swelling of the arm, it was impossible to tell where the vessel was wounded. Basilic vein found bleeding into hæmatoma, and tied; laceration found in lower third of brachial artery, half an inch long, and severing the vessel across except for a slender shred on the inner side; the latter divided after tying the vessel above and below.

When the clot was washed away, a slit-like aperture was found in the median nerve, which left three-quarters of the trunk sound, on the outer side, but only a small strand of fibres on the inner,—less than a quarter of the nerve being thus cut across by the perforation.

Nerve replaced and wound closed. Healed by first intention; invalided to England March 20. At Netley, April 19; official

record says, "sensation was lost in median, but is now returning." Still serving, and Dr. Power in medical charge of the unit certifies February 24, 1904, "sensation and motion normal."

Remarks.—The three cases here given are the only ones in which a deliberate examination of the nerve lesion in the bullet-track was made at our hospital, at an early stage in the lesion. Indeed, when the second case was found to be like the first, we came to the conclusion that partial lesion of a nerve trunk did not require operation in a wound that had healed by first intention, whether the lesion was due to mere contusion, or to notching, or perforation as well; and, as already stated, no case of complete severance in such a wound presented itself. As a consequence of this policy of non-interference, we had little further opportunity for studying the nature of the nerve lesions in the numerous cases that passed through the hospital. This, it will be noticed, is the reason that, in the other cases here given, the nerves were only examined in the course of an operation for aneurysm.

The nerve cases that require operation at a later stage are those that heal slowly, by granulation, in a septic wound. These latter were, as a rule, invalided home, before any pressure symptoms from cicatricial contraction set in, and frequently before the wound had closed. I do not remember operating on any case of this kind of bullet wound. Moreover, either notching or perforation of the nerve would be difficult to recognise at this stage, on account of the other deformities, caused by the strangulating tissues around it. Mr. Stanley Copley, however, on July 13, 1901, operated on the internal popliteal nerve in one of these cases. He told me, some time afterwards, that he found a string of cicatricial tissue leading across from the entrance to the exit scar, through the nerve trunk, in such a manner as to suggest that the nerve had been perforated.

It would be obviously unwise to draw general conclusions from these four cases only, amongst the large number of nerve cases that would be met with in the 2,800, or so, "wounds in action" treated by us, even occurring as they did in the only four cases deliberately explored at Mooi River. The experience of others who had opportunities, during the war, of observing the early stage of Mauser lesions may yet throw some light on the relative frequency of perforation to other lesions of the nerve.

Meantime, it seems certain that, if the lesion here described is not the commonest of all nerve lesions where the small bore mantled bullet is concerned, it is at least sufficiently frequently met with to deserve consideration in gun-shot wounds of nerves in future.

Fortunately, however, from the point of view of treatment, the nature of the partial lesion does not matter in the least; and the following rather typical case, in which the brachial plexus was traversed, possibly contained, in different cords of the plexus, illustrations of all three kinds of partial lesion.

Before describing this last case, it seems necessary to say something about a nerve lesion that has occupied a rather prominent place in military surgery hitherto, namely, "concussion" of the nerve trunk. It would be difficult, perhaps, if not impossible, from the classical symptoms attributed to this condition, to separate it from slight contusion of the nerve, either alone, or in association with the compression of extravasated blood. Besides, the more opportunities one has of exposing the nerve to view, at an early stage in the lesion, the more sceptical one becomes, perhaps, as to the existence of the condition at all. Moreover, such a condition of the nerve trunk itself, as distinguished from a nerve "centre," would hardly seem to be in accordance with present physiological knowledge. However this may be, the existence of "concussion" has still the support of the highest authorities. It was therefore necessary to make passing allusion to it; but as we entertained no suspicion of this lesion in the cases which reached our hospital, on account, perhaps, of their being nearly always some few days old, it will not be further considered here.

Case 4.—Lieut. the Honourable ——, wounded March 15, 1902, transferred to No. 4 General Hospital, Mooi River, twenty-eight days later. Left arm paralysed, hand scalded—the result of lost sensation, and dipping it into very hot water (which he did not feel), to relieve intense pain in the arm after receipt of wound. Entrance (normal Mauser) on front of arm, just at junction with axillary fold, from which protruded a nipple of dried blood clot; exit long healed, over chest, on same side, one inch and a half from fifth dorsal spine. A large, tense, pulsating aneurysm filled the axilla; face blanched, and history of severe recurrent hæmorrhages from the entrance wound. With the arm drawn from the side, an incision was made across the axilla, in the line of the main artery; the aneurysm was rapidly emptied of clot and the vessel seized. In this procedure I had the advantage of the kind assistance of Lieut.-Col. Lucas, C.B., and Lieut.-Col. Hackett, of the R.A.M.C. The rent in the artery, which was situated high up between the heads of the median nerve, at the junction of the lower and middle third, was three quarters of an inch long. The vessel was ligatured above and below, and the space flushed out. No divided nerve was seen;

but, as the patient was very weak, *there was no time for a deliberate examination of the plexus for other lesions.* The wound was closed, and it healed by first intention. Pain was much relieved by the operation, and when the sutures were being removed he could move his arm away from the side; but he regained little further power in the limb up to May 21, when invalided to England.

On arrival home, acting on our advice he saw Mr. Anthony Bowlby, who, amongst other things, prescribed a rigorous course of massage, with electrical treatment of the limb. Progress slow, but steady, for twelve months, afterwards much more rapid.

During this time he suffered from "trophic" disturbances; Weir-Mitchell "glossy skin," swelling and stiffening of joints, hyperæsthesia, wearying pain, and mental depression. After eighteen months, when he appeared before the last Board, there had been remarkable progress; arm and forearm practically normal; wrist-drop, pain and mental depression disappeared; skin healthy looking. The fingers were still paralysed, and sensation below wrist was impaired. The thumb, however, was beginning to recover, so that he could hold a stick between it and the hand. Allowed to rejoin his regiment.

Remarks.—Although contusion alone, or with perforation, or notching of more than one cord of the plexus, must have occurred here, the prognosis of ultimate recovery of the fingers—of the coarser movements at least—would seem justified by the results obtained in the first three cases.

This is to be deduced from the fact that perforation, which occurred in all the others, was the severest form of any single lesion that could be caused by the bullet in this case. Mr. Bowlby, evidently relying on the description sent home, of the appearances of the nerves in the open wound, did not consider any further operation indicated. Otherwise, on account of the complexity in origin of the individual nerve trunks affected, it would probably have been impossible, without exploration, to exclude total transverse section of one or other of the cords of the plexus.

This question of operative interference, so difficult to settle in a complicated case like the last—in view of the fact that nerve trunks have been found completely divided, it is said, by the normal Mauser bullet—is, where single nerves only are concerned, decided, it would seem, by the results obtained in the previous three cases. The inference to be drawn from the latter is undoubtedly, that, in partial lesion of a nerve trunk, where the wound has healed by first intention, any operation on the nerve is unnecessary. The only

apparent exceptions to this rule are really cases with complications, such, for instance, as where adjacent bone has been damaged and the nerve is, in consequence, being tied down by callus.

It is true in all these cases a string of cicatricial tissue is left behind in the bullet-track for many months after the wound has closed. This is unavoidable in all wounds causing loss of substance, and thus healing under scab, as do bullet wounds. After normal Mauser wounds, at least, this cicatricial string is very fine. But whether the young fibres grow through, or round it, remains to be demonstrated.

All we know about the matter clinically is, that this sort of cicatrix does not seem to materially interfere with their growth; and, until the results to be anticipated from nerve suturing generally are more definite and certain than they appear to be at the present time, it is not advisable to interfere with these partial breaches of continuity.

Our knowledge of the mode of healing of nerve injuries generally may be said to be as yet in its infancy, notwithstanding the recent interesting contribution of Messrs. Ballance and Purves Stewart ("Healing of Nerves"). The method of reproduction of the axis cylinder, the behaviour of the cicatrix, and even the time required for repair in the human subject, after a simple and clean section of a nerve trunk, are all very obscure still.

Mr. Bowlby, in his work on "Injuries and Diseases of Nerves," insisted on a term of years, not of months, being allowed for anything like complete restoration of function. The history of the few cases here given entirely bear out his view, as far as they go, and I have had opportunities on Medical Boards of seeing many other such cases which showed little improvement in the first six months or more, though eventually recovering completely to all appearances.

Should it be definitely shown yet, that better, or even quicker results are to be got from surgical interference with suture, in these aseptic cases, than the results in the cases here detailed, then of course the above conclusions will require modification.

It is probable that the differences in tension on this scar string, set up during muscular action, may cause irritation of the nerve. In some of these cases the pain during the long healing process has been found almost unbearable, an observation made long ago by Drs. Weir-Mitchell, Morehouse and Keen, in their work on "Gunshot Wounds and other Injuries of Nerves." If, in a very exceptional case, an operation be undertaken for its relief, it is

as well to remember, that, no mere division of the cicatricial string is likely to be followed by anything but temporary alleviation of that symptom.

Whatever misgivings we may have on theoretical grounds, as to the wisdom of leaving this string of scar tissue alone, rather than attempt to hasten the reparative process in the nerve by its removal, it is important to note here, further, that in these cases no compression of the nerve demanding operation can arise later. This follows from the fact that the cicatricial string does not envelop, but merely runs through the nerve in perforation, thus leaving the sides free; while, in notching, and contusion, it is confined more or less to one side of the nerve only.

On the other hand, where the wound becomes septic and so heals slowly by granulation, with formation of pus, the nerve trunk is in great danger of being embraced in the large amount of scar tissue left behind in such a wound. In the latter case strangulation of the nerve will certainly follow, unless it is relieved by operation. As already mentioned, these patients were usually invalided to England before the stage of compression declared itself. On arrival home there were, no doubt, few of these cases in which operation for the release of the nerve was not imperative. When the wound has closed, so that the part can be rendered aseptic, then obviously the sooner this operation is done the better.

It will have been noticed, perhaps, that no mention is made of "neuritis" in the cases described. This is because there was no naked eye sign of inflammation in any of the nerves exposed. Contrary to what is usually taught, I do not think that there is any tendency to inflammation of the nerve in the ordinary sense, as a direct result of injury from the bullet. The hyperæsthesia, pain and trophic disturbances generally, which arise later, even in aseptic wounds like that of Case 4, although attributable perhaps to the irritation of the cicatrix as already explained, would seem to be clinical manifestations of repair only, rather than of inflammation. At least I know of no observations made on nerves in that stage, in which, apart from cicatricial strangulation of the nerve, the ordinary evidences of inflammation were found on exposing the latter. This is a point which might, perhaps, be cleared up by those who were operating at home on the invalids returned from South Africa; for there is reason to believe that the distinction here drawn between Mauser wounds that healed by first intention, and otherwise, as regards suitability for operation, was not recognised, at least in civil hospitals and in private practice. Meantime, it is highly probable,

that "neuritis" also, strictly speaking, is for the most part confined to septic wounds.

Altogether, then, it will have been gathered from the foregoing, that, in nerve wounds, the importance of obtaining primary union in the bullet-track can scarcely be exaggerated. It is on this question that, as a rule, the whole prognosis of the case turns. Fortunately, in the South African war, this result was attained without any trouble in the immense majority of cases. It was, in fact, astounding how readily these Mauser wounds closed and scabbed over when not interfered with. Even when implicating the large body cavities it was quite an exceptional experience to find that a normal Mauser wound was not scabbed over on removal of the "first dressing."

This unusual experience, in the case of wounds exposed to what would be considered at least an ordinary amount of septicity, has led to some speculation as regards its cause. It is not that the "first dressing" has not been credited with its full share of praise in contributing to the desired result; nor that the influence of the pure air of the South African veldt on the vital, as distinguished from the physical and chemical factors of repair in wounds, has been overlooked. But, having admitted the excellence in many ways of the regulation dressing, it is obvious that the circumstances under which it has to be applied at the Front are anything but those that would satisfy a surgeon nowadays, in the closure of an operation wound for instance. Besides, we have most of us seen odd cases, in which, on an emergency, a "puttie," or anything to hand, was improvised into a first dressing, with what appeared to be an equally good result as regards aseptic union.

There is just a danger, at the present time, of our attributing more than a due share of the success attending the treatment of wounds generally to "asepticism," or to some one or other of the rival "antiseptic" systems. Or rather, perhaps, the danger lies in neglecting the physical factors acting upon the wound, which are common to them all, and which are pre-eminent in the healing process, in our excessive solicitude for the mere minor aiding factors introduced in the complicated details of any particular system.

This view of the matter was brought home to us forcibly by M. Preobajensky, in an article in the *Annales de L'Institut Pasteur*, in September, 1897—an article which by the way would well repay the attention it seems not to have attracted in this country up to the present time. M. Preobajensky in this paper, demonstrated conclusively, from the results of physical experiments, and experi-

ments on animals, the overwhelming importance of the physical, as compared to the chemical qualities of a dressing. Briefly, he shows that the forces of evaporation, osmosis, and capillarity in a wound, when intelligently assisted by an absorbent dressing, can set up such a fluid current from the depths of the wound to the surface, that ordinary infection of the wound is practically impossible, and that even the deliberate infection of it by such a highly virulent microbe as that of anthrax is a matter of some difficulty.

Our experience with Mauser wounds in South Africa amply testify to the soundness of this view. To take, for example, Case 4, here given, which, although an exaggerated instance of the kind, will well illustrate the importance of these physical forces which keep a wound aseptic in spite of untoward surroundings. Here the large cavity containing clotted blood—a very suitable pabulum for microbes—was in free communication with the air, for nearly a month, without the slightest sign of infection resulting.

We are not surprised at this, because it is notorious that these cases of recurrent hæmorrhage, unlike those of secondary hæmorrhage, do not lend themselves to infection. No satisfactory explanation of their immunity, however, can be given, except the physical one, namely, that there is such a constant current kept up by the blood pressure, from the depths of the wound to the outside, that the inward growth of microbes into the wound is effectually barred.

Of the same nature, if in lesser degree, is the current that saves ordinary Mauser, and indeed all well-planned operation wounds from infection, provided that it is not interrupted by tampering with the wound, or by an impermeable dressing, or one that becomes so from neglect. The wound falls together in its depths, so as to leave no cavity containing stagnant blood; and whatever little fluid exudes between the raw surfaces is kept in constant motion outwards, until the wound is healed dry from the bottom. The dry climate of South Africa peculiarly lent itself to aiding in this process, which would thus explain the unprecedented success obtained in the primary treatment of gunshot wounds in the late campaign.

As regards dressings M. Preobajensky found that, provided a sufficient "molecular adhesion" existed between the dressing and the fluid in the wound, the efficiency of the former, practically speaking, entirely depended on its permeability and capacity for absorption. For the absorption of blood serum from a recent wound nothing has been introduced into practice since the date of his experiments that stands higher than gauze, such as is used in

the regulation "first dressing," and generally speaking in every system of dressing in common use at present. So that, if we except that method of hermetically sealing wounds, in which appeal to all outside help is discarded, it may be said that gauze, or a gauze substitute, is the only thing common to all "aseptic" and "antiseptic" systems.

In this way it was that M. Preobajensky reconciled the results obtained by successful surgeons from what superficially appeared to be widely different, and more or less antagonistic, systems of dressing operation wounds. To some of us, perhaps, his conclusions may not have any the less significance in that they strikingly recall Mr. Herbert Spencer's generalisation with regard to the similarly various and antagonistic systems of Religion, "There is a soul of truth in things erroneous."

HIGH FREQUENCY CURRENTS.

By Major J. Fayrer.
Royal Army Medical Corps.

When the discharge from the secondary coil of a powerful *induction coil*, connected with the inner coatings of two Leyden jars, takes place the outer coatings of these jars are correspondingly strongly affected (by induction). Suppose these outer coatings are each connected with the terminal of a suitable coil of thick copper wire, known as a self-induction solenoid, oscillations of electricity will take place in this solenoid as rapidly as the discharge of the Leyden jars takes place. If the induction coil be provided with a suitable contact-breaker, of which the mercury - jet interrupter is the best, the rapidity of these discharges is enormous, and may even amount to millions per second. Now, if the solenoid coil be prolonged into what is called a resonator, "electrical resonance" will be set up in this prolongation, and at the terminal of the resonator a *high frequency current* will be emitted, to find its way back either through the atmosphere or by an earth wire connected up, so, as it were, completing the circuit.

A patient placed in this circuit will therefore become a part of it, and physiological effects will be produced. In the ordinary apparatus used an induction coil capable of giving a 10 inch spark from the secondary coil is used. This is actuated by a current supplied either from the street main or from a battery, or from an accumulator, and the strength of such a current is usually about 100 volts. The *ampèrage*, on the other hand, is very small, one ampère being generally sufficient. So that although the current passing through the solenoid is of enormous intensity, perhaps amounting to half-a-million volts, its quantity is microscopically small.

The *violence*, so to speak, of the high frequency current is so enormous that streams of pale luminosity (known as the "brush") are seen to escape from the terminal of the resonator. This current has but small respect for insulators, and it is most difficult therefore to prevent leakage. *Thick* india-rubber coatings round the metal cable are required to restrain its impetuosity. The diagram shows the ordinary arrangement of the apparatus.

The physiological effect produced by high frequency currents may be summed up in the three words *greatly increased metabolism.*

To enter into the subject of metabolism and metabolic tissues would be to write an oft-repeated thesis in physiology, so, for the purpose of this short and purely practical article, I presume that the subject has been studied, and content myself with pointing out in a general way what metabolism means. We may define metabolism as "the exchange of material," a process set in motion by "nerve force" (electricity), essential to the introduction, assimilation, integration, and excretion of matter. In order to live and be

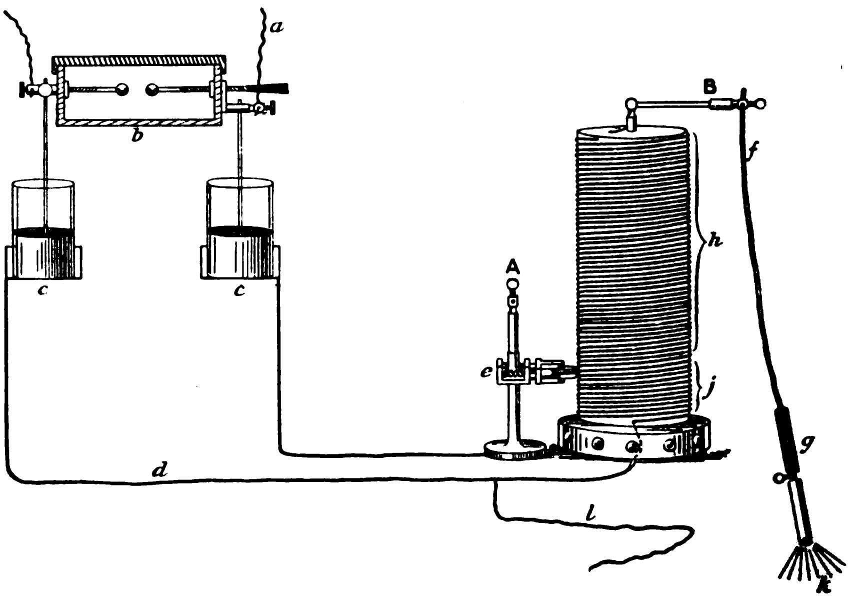

FIG. 1.—A, terminal; B, terminal: *a*, from induction coil; *b*, discharge takes place in glass box, to deaden the sound; *c*, Leyden jars; *d*, connecting wire; *e*, wheel contact with solenoid; *f*, wire in thick insulation; *g*, handle; *h*, resonator; *j*, self-induced solenoid; *k*, brush; *l*, lower terminal for earth or couch, the couch having a zinc sheet under the cushion.

N.B.—When the brush treatment is not required, but merely the sol enoid current, the electrode may be connected with A instead of with B.

healthy all these qualities are essential to the human being, and the inability to carry out any of these natural processes means ill-health or disease, *i.e.*, metabolism is imperfect, it requires increasing. If metabolism is imperfect we require the introduction into the system of some factor which will regulate the processes of "give and take."

An ordinary course of treatment by the high frequency currents

generally involves at least six attendances. The process, for the patient, is simple, and unattended by inconvenience or unpleasantness. There is absolutely no sense of discomfort or pain, and no *shock* whatever is felt. The patient lies on a couch holding a brass cylinder which is connected with the cable leading from the terminal of the resonator, or wheel contact, as may be determined by the exigencies of the case. The time occupied in one sitting is about fifteen minutes. Six such sittings often terminate the course, and the malady from which the patient is suffering. But in disturbances of long standing, of an intractable nature, as many as thirty, or even more, sittings may be needed. As explained already, the patient is so placed that he, or she, becomes a part of the circuit, *i.e.*, the couch on which the patient reclines is joined by a connecting wire so that the carefully insulated current (insulated from leakage) passes through the body *en route* to complete the circuit.

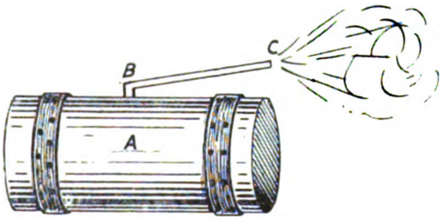

FIG. .

During this process there is, as above mentioned, no sensation whatever, but the fact that the patient is receiving his full share of the currents can easily be demonstrated by drawing sparks from elbow, knee, or any other part of the body, even through the soles of the boots. It seems almost incredible that such a demonstration of force can pass through the body without causing any inconvenience or sensation; such is the case, however, because I have tried it, and the reason for it has already been explained, viz., that although the current passing through the solenoid is of enormous intensity, amounting perhaps to half-a-million volts, its quantity is microscopically small, or, to put it perhaps more clearly, the electromotive force is enormous, its quantity being small; or, take a parallel instance, as in the case of another force, viz., steam: let A represent a boiler containing steam at an enormously high pressure, let B—C represent a fine tube leading from the boiler and allowing of the escape of the steam which, in the tube, is still at an equiva-

lently high pressure. In this case you have a tremendous force, reduced, however, to a minimum in quantity.'

When one considers what all this means it is not difficult to understand that very startling results are obtainable. A nervous system run down by illness, by over-fatigue, exposure to climatic influences, &c., is quickly restored to normality. The central nervous system, from which "nerve force" arises, is itself improved in condition and, therefore, able to supply the necessary stimulus to metabolism, a stimulus which disease may have greatly reduced in efficiency. Meanwhile the high frequency current acts as a substitute for the wanted nerve force. Functional inactivity of organs yield to its influence in a surprisingly short time; for instance, insomnia gives way to sound slumber, long-standing cases of constipation are generally cured after a few applications of the current, torpidity of the liver passes away, neuralgia from whatever cause vanishes like magic, local asthenic troubles depart, piles contract, fissures of the anus heal up, lassitude is no longer felt, the circulation is improved; in short, instead of feeling ill a patient soon feels well. The pain of malignant diseases is greatly mitigated, though the actual disease has not been known to yield to the treatment.

My friend Mr. A. St. Clair Buxton, of ophthalmic fame, has an installation, and I was so impressed with the working of the apparatus, the common-sense treatment indicated, and the results obtained as a consequence of treatment, that, with his sanction, I will presently give some short notes of cases treated by him. The description of the apparatus is from his description of it to me.

Shortly after my first introduction to the installation I happened to be conversing with a very eminent member of our profession, and I asked him what he thought of the high frequency treatment. He replied, "it is like throwing a brick into a china shop, something must happen." His remark was clever and peculiarly apt, up to a certain point. There is no doubt that "something" must happen, but in the case of the china shop we can scarcely imagine the "something" being of any special benefit, either to the shop or its owner. But the high frequency brick thrown into the human china shop certainly does "something," and, in proper hands, does something extremely useful. Unlike the action of the brick, its effect is not a chance one, and it not only, like the ordinary brick, possibly breaks up a lot of rubbish that is not required, but it further puts the body in a condition to eliminate that rubbish and leaves a clean and garnished interior. The high frequency brick too, differs from the commoner missile in that its introduction into the human

china shop produces a physiological action by means of which the rubbish is broken up and eliminated, whereas the good and valued "bric-à-brac" is left undisturbed, or its beneficial effects enhanced.

The following cases show the results obtained:—

(1) An Anglo-Indian, aged 63, who had had sunstroke, lately had a cerebral hæmorrhage; pain in the head and neck, and even face and shoulders, was persistent for nearly a year after the event. General ill-health prevented him from taking exercise. Pain in the calves of the legs from neuritis followed an attack of influenza, which came on three months after the hæmorrhage. He could not eat, food nauseated him, grains of uric acid were passed with the urine, and, finally, he was practically reduced to lying down, or reclining in an easy chair, all day—a wreck! Seventeen applications enabled him to walk five or six miles a day, all pain left him, appetite returned, and, in fact, not a single one of the symptoms now remains. He now cycles about ten miles a day and walks easily without the least fatigue.

(2) A lady, aged 59, with recurrent carcinoma of the breast, was advised to undergo further operation. Pain had reduced her to such a poor condition of health that she felt in a hopeless state and quite unable to undergo further surgical treatment. Twelve applications quite removed the pain and restored her general health so completely, that a fortnight later she felt perfectly fit to go into the Home for the operation.

(3) Chronic constipation of five years' standing from atony of the bowel in a medical man at Wandsworth, who took aperients daily, yielded after five applications, and he has never been troubled since.

(4) A man, aged 71, who suffered from acute sciatica for five months, and who could neither walk nor sit except with great pain, was restored to perfect health after twenty applications. He now describes his condition as "first-rate."

The above instances are sufficient to indicate the kind of cases which are undoubtedly benefited by the application.

Some further advantages of treatment by high frequency currents are that no sensations of pain, shock, or discomfort, are felt, no clothes need be removed while treatment is applied, the improvement brought about as a result of the treatment does not stop when the applications cease, on the contrary, it continues to be more and more marked.

Beyond the peculiar interest attached to the subject, and the fact that undoubted good has resulted from the application of high frequency currents, I have written this short article because it

seems to me that this form of treatment is eminently suited to cases so commonly met with by army medical officers, and perhaps especially by those of us who have served in India. I refer to those cases in which no organic lesion can be detected, but which, nevertheless, are most distressing, and are classified by the sufferers themselves under the expressive nomenclature of "loss of nerve." How repeatedly do we meet men who say, "I have lost my nerve"; and what does this mean? That as a result of repeated attacks of malaria, dysentery, insolation, over-fatigue, over-work in a trying and enervating climate, a necessary balance is lost, the "give" is unequal to the "take," or *vice versâ*, the result being an imperfect metabolism. Such cases, it seems to me, are the very kind to go through this treatment, and I can confidently say they will do so with some, if not complete, success.

Further, cases in which organic lesions (the sequelæ to malaria, dysentery, enteric, &c., &c.) are evident in the form of thrombosis, neuritis, a tendency to fatty degeneration, hæmorrhoids, susceptibility to acute attacks of liver, fissure in ano, constipation, diarrhœa, &c., &c., would all benefit.

In conclusion, I would say that this article is written entirely from a conscientious desire to draw attention to what I am convinced is a therapeutic success, and in no way pretends to be scientific or original.

I would add that Mr. Buxton will be very glad to show his installation and its working to any officer of the R.A.M.C. who would care to see it. I will gladly give any of my brother officers a card of introduction to him, and he can make his own appointment for calling.

SOME OBSERVATIONS ON AN OUTBREAK OF MEDITERRANEAN FEVER IN MALTA LAST YEAR, WITH SPECIAL REFERENCE TO THE "AIR-BORNE" THEORY OF CONVEYANCE OF THE INFECTION.

By Major S. GLENN ALLEN.
Royal Army Medical Corps.

In the "Editorial" on Mediterranean Fever which appears in the current number (April) of the Journal, allusion is made to the unusually severe outbreak which occurred in Malta last year.

Having had charge of the Floriana district, where the battalion was quartered which suffered more severely than any of the other troops in the island during this outbreak, I have read with particular interest the detailed statement concerning the extent and limitation of our present knowledge of Mediterranean fever, more especially with reference to the probable mode of conveyance of the contagion. I would not, however, have ventured into the discussion of this vexed question had it not been for two reasons.

(1) Because, I gather, from certain remarks in this "Editorial," that the "air-borne" theory of propagation has been definitely adopted by certain officers in Malta, as affording a satisfactory explanation of the origin and spread of the disease among the troops last summer.

(2) Because, I believe, that the chief (if not the only) grounds of suspecting the infection to have been "air-borne" arose from undue importance being attached to certain special local conditions, which chanced to exist in connection with the Floriana barracks and married quarters, at the time that the origin of the epidemic was under investigation.

I may say at once that I have no belief in the correctness of this view, whether it be considered as of general application, or merely as explaining the origin of this particular outbreak.

The theory of conveyance of the infection by some blood-sucking insect (not, perhaps, necessarily of the gnat species), which is advocated by Dr. Zammit, bacteriologist to the Public Health Department, Malta, and others (and of which I myself am a humble adherent) will, I believe, eventually be found to be the correct one, as it best explains many otherwise unaccountable cases, and fits in with all known facts. I must, however, at once admit that I can bring forward no absolute scientific proof in support of this belief.

For, as far as I know, all attempts to find the specific micro-organisms in the bodies of gnats, flies, or other blood-sucking insects, which exist in Malta, have hitherto failed; and, moreover, my acquaintance with the disease has been rather that of the clinical physician and sanitary officer than that of the bacteriologist. Nevertheless, in the present uncertain state of our knowledge, discussion of the question, from different points of view, by officers who have served in the Mediterranean, may help to throw a little more light on the obscurity which still surrounds the subject.

In order to explain my reason for refusing to accept the "air-" or "dust-borne" theory of the spread of the infection in Malta last summer, I must briefly describe certain pre-existing conditions in the Floriana district, Malta.

The battalion which suffered so severely arrived in Malta from South Africa in October, 1902, and was at once quartered in the Floriana Barracks. These barracks consist partly of stone buildings and partly of huts, the latter being of modern construction. Their situation is superior, from a hygienic point of view, to most others in the island, and, in spite of certain structural defects in the older parts, their sanitary condition (ventilation, drainage, water supply) has been satisfactory, at any rate of recent years.

When the battalion in question first arrived it contained a fair proportion of seasoned men; but during the winter its strength was increased, and the places of old soldiers sent home, time expired, were filled by the arrival of two or three drafts from the Depôt. So that by the time the warm weather began, there were a good many young soldiers in the ranks, who, by reason of their immaturity, may reasonably have been considered as specially liable to infection. Consequently, in whatever way the disease was conveyed (the fever being endemic in the island) a good number of cases might have been expected to appear during the summer.

It is admitted, however, that the percentage attacked, as compared with other regiments apparently less favourably quartered, was too great to be completely accounted for in this way; and it did not explain the cause of the outbreak among the women and children. Some other local condition had, therefore, to be sought for.

It happened that a new block of married quarters had been completed just before the arrival of this regiment, which was occupied for the first time by the married people belonging to it. These quarters overlooked the Quarantine Harbour. The site was a good and airy one, and every modern sanitary improvement had been provided. For the first six months the occupants enjoyed

good health. About the middle of June, however, cases of Mediterranean fever appeared, and the infection passed from quarter to quarter until a large proportion of the families were affected.

(I regret that being obliged to write from memory—not having the necessary records by me—I cannot give the exact figures and dates, but the statements made throughout are sufficiently definite for the purpose of this paper.)

In attempting to trace the origin of these cases it was at once obvious that the old convenient scapegoat of "local insanitary conditions" which has done duty so often, to account for outbreaks of the disease under all sorts of different circumstances, could not be made to serve here. Nor could the milk or water supply be reasonably brought under suspicion as the vehicle by which the specific germ had gained admission; some other special local condition had to be found. Attention was at once directed to the fact that the soil within a few yards of the affected building had recently been disturbed in digging the foundations for another block of quarters. This was at once seized upon to explain the appearance of the disease in this recently-constructed and sanitary building. A soil (theoretically) contaminated by the presence beneath the surface of the micrococcus melitensis had been dug up and dust from it, dried by the sun, and containing the specific germ, had been carried by the wind and inhaled or swallowed by susceptible persons. Such were the facts which were held to point to the air-borne conveyance of infection in these cases, and if in these cases (it was argued) probably in others in the island.

About the same time that the disease showed itself among the women and children, cases also appeared among the single men and grew more numerous as the summer went on. The barracks proper are within two or three minutes' walk of the block of married quarters in question, but stand on a higher level and are protected to a great extent by the ramparts of the old fortifications from winds coming from the direction of the Quarantine Harbour, and therefore from the supposed source of infection.

Within a stone's throw, however, of the entrance to the barracks, two new blocks had been for some time under construction; the ground here had necessarily been disturbed in digging the foundations, so that a similar source of infection existed, or was supposed to exist, as in the former instance.

This theory of "air-borne" infection was accepted and advocated at the time by the S.M.O. in Valetta, and the sanitary recom-

mendations put forward to check the disease were based upon it. It is apparent from the statements in the Editorial that Capt. J. C. Kennedy, R.A.M.C., who was then in charge of the Valetta Laboratory, has also adopted this view, which, for reasons set forth below, I hold to be an erroneous one.

Apart from the fact that the existence of the micrococcus melitensis in the suspected soil could never be demonstrated, there are several other facts which to my mind make it (to say the least) doubtful whether the connection between the digging up of the ground and the appearance of the disease can be considered anything more than coincidental. Briefly described these facts are as follows :—

(1) By the time the fever made its appearance among the single men the new blocks of barracks were practically completed. The disturbance of the soil, involved in digging the foundation, had taken place during the time that another battalion was stationed in the Floriana district, among whom no exceptional number of cases had occurred.

(2) Within a few yards of these new barracks there is a larger and much older block of married quarters, and, from a sanitary point of view, inferior to those of the Quarantine Harbour. I never heard of any outbreak of Mediterranean fever among the inmates during the time the foundations were being dug and the building operations were in progress.

(3) As regards the new married quarters, already spoken of several times, cases did not appear among the occupants until the digging operations had been completed for (if I recollect rightly) several weeks. Not in fact till the warm weather—the usual fever season—had commenced. The fever season of last year was a very bad one, an unusual proportion of R.A.M.C. Officers being among the victims of this scourge of Malta; consequently, it is no matter for surprise that a considerable proportion of the women and children of the newly-arrived battalion began to suffer at this time.

(4) If, however, the disease originated among them from the turning up of the germ-infected soil close to their dwelling place, we should certainly have expected an earlier appearance of the disease, that is, while the actual digging operations were in progress. It must be remembered that Mediterranean fever is by no means uncommon in the winter and spring in Malta, and supposing that a special source of infection had really been laid bare, as suggested, the result would surely have become apparent during the earlier months of 1903.

I have been led to comment at some length on the favour shown to this "air-borne" theory of propagation by some, as I fear that if it should come to be generally accepted by military medical officers still in Malta, and who have opportunities for studying the disease there, as a "working hypothesis," they will be following a wrong track, and the distinction of clearing up the obscurity in connection with the conveyance of this disease, and so leading to a really efficient method of prophylaxis, will not belong to an officer of our Service, as I most sincerely hope it may.

As it was owing to the perseverance and acumen of an R.A.M.C. officer that the real cause of the fever was first discovered, and its right to be considered a specific disease, distinct from enteric, malaria, &c., demonstrated; and as it is also due to the work of the former Professor and Assistant Professor of Pathology at Netley, that we possess the method of serum diagnosis, Mediterranean fever may be considered in a great degree as the special property (if I may use such a term) of our Corps.

One could scarcely help, I think, feeling some regret if the secret of its spread should eventually be discovered by some civilian or foreign scientist, or even by a medical officer of the sister service.

As repeated investigations by competent bacteriologists have failed to demonstrate the existence of the micrococcus in the excreta of patients suffering from this disease, surely the method of aërial propagation should not be considered a satisfactory explanation of the origin and spread of infection in epidemic or isolated cases. If the excreta do not contain the specific germ, as up to the present we are entitled to assert, how can the soil become infected? Until the micrococcus melitensis has been shown to be passed out of the body in the excreta, the theory of the conveyance of the disease by inhalation of germ-laden dust should be considered "out of court."

Whereas the theory that infection is conveyed from sick to healthy individuals by means of a blood-sucking insect seems, with the analogy of malarial and yellow fevers before us, far the most reasonable we can adopt as a "working hypothesis;" especially as since the presence of the micrococcus in the blood has been demonstrated in several cases, the only really insuperable difficulty to its tentative acceptance has disappeared.

I have already I fear made these observations too long. I would like, however, just to allude, in conclusion, to one more point bearing on the subject, namely, that as a result of having had to investigate the origin of numerous cases of Mediterranean fever I have been led to the conclusion that the influence of insanitary

conditions as a directly causative agent has been exaggerated, or at any rate that the inmates of the most sanitary barracks and houses do not appear to be more exempt from the disease than those less happily placed.

Dr. Zammit, of Valetta, has made some investigations with regard to the civil population, which point to a similar conclusion. His figures showing the incidences of the disease, for several years, among the inhabitants of the most insanitary parts of the island, as compared with the same among those in the better parts, are a very striking exemplification of this curious fact; and in spite of the undoubtedly great improvement in the sanitation of Valetta and other Maltese towns, effected of late years, the same observer told me that it seemed to him, that Mediterranean fever was rather on the increase than otherwise.

To guard myself against misconception, I will conclude by saying that I do not, of course, doubt of ultimate benefit to the public health resulting from every sanitary improvement, or of the necessity for the utmost vigilance in this particular as regards the troops under our care. What I do mean to assert is, that the best obtainable sanitary conditions will not prevent the appearance of cases of Mediterranean fever, and that there is some factor or factors to be sought other than those generally included in the term "insanitary conditions."

NOTE.—While serving in Malta it occurred to me that it would be a good thing if permission could be obtained to bring out a new edition of the late Capt. Hughes' book on Mediterranean fever. It is now a good many years since it was published, and if an R.A.M.C. officer would undertake to "edit" a second edition, embodying in it the work done and the additional experience gained of recent years, it would be a most useful piece of work, and serve also to prevent the book from falling into oblivion, as it seems in danger of doing.

The idea of seeking permission to undertake the task myself did, I confess, cross my mind, but I came to the conclusion that my knowledge and experience of the disease was not sufficiently extensive to warrant me making the attempt, a considerable portion of my "tour" having been spent in Crete, where Mediterranean fever certainly exists, but is quite insignificant as compared to "malaria," which is the important disease in that island.

ON THE INSTRUCTION OF STAFF AND REGIMENTAL OFFICERS IN MILITARY HYGIENE.

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Among the changes and developments in military medical matters that owe their origin to the action of the Advisory Board for Army Medical Services, there is one which, though at present small and insignificant, may in time prove to be of far-reaching extent and considerable importance in regard to the health of our army, both at home and abroad, both in peace and in time of war. As the result of a recommendation from this Board, in the early part of 1903, the Secretary of State sanctioned the proposal, that regular courses of instruction in military hygiene should be given, by specially appointed officers of the Royal Army Medical Corps, to cadets at the Royal Military Academy, Woolwich, and Royal Military College, Sandhurst, and to officers at the Staff College; also that short courses of instruction in this subject should be given by medical officers in various districts, the attendance on which would be voluntary, it being considered that many regimental officers would avail themselves of the facilities thus afforded.

Action has been taken in the direction indicated, and during the past year short courses of lectures have been delivered at each of the three educational institutions mentioned; while, as regards regimental officers generally in the various districts throughout the country, arrangements are now being made to give somewhat similar courses of instruction at such times as may be most convenient to all concerned. The hours of the British officer, whether staff or regimental, are indeed nowadays very fully occupied with musketry, gunnery, signalling, veterinary, gymnastic and other courses of instruction, spread over the whole twelve months, from January until December, so that it has not been found altogether easy to take a pliant hour for this subject; "for want of idle time," as Shakespeare put it, at the disposal of the British officer of the present day. A beginning, however, is being made, and it may be useful to note down some general observations as to the scope and character of the instruction that should be given.

We may first say something as to the *need* for instructing combatant officers in matters belonging to hygiene. It might be

said that there is already a body of officers, viz., those of the Royal Army Medical Corps, who are charged with these duties, and that it is *their* business to do this work; the time and energies of combatant officers are fully taken up with their own proper sphere of duties; and neither in their educational stages have they leisure, nor when actively engaged in their own profession of soldiering have they any need, to cumber themselves with what is, after all, a technical and scientific subject belonging to the studies of another profession, the medical; a subject indeed extensive enough to occupy exclusively the whole time and energies of a considerable subdivision of that profession, the sanitary or public health service. In reply to this it will not be out of place to relate the following instances of what has occurred under the conditions that have obtained, up to the present, in regard to the knowledge, or want of knowledge, of sanitary matters possessed by combatant officers; it might perhaps be better to say want of appreciation of their importance.

Dr. George Turner, Medical Officer of Health for the Transvaal Colony, relates that at one station, during the late war, where there was a good well supplying pure water, he watched the troops fetching water in their bottles; he did not see any men fill their bottles at this well, but several did so from a polluted spring about fifty yards nearer to the camp; and this went on right in front of the commanding officer, who was sitting outside his tent. At another camp, near Pretoria, where pure water was provided in pipes at great expense, he saw about a dozen men fill their bottles from a leak in an irrigation channel which contained the foulest water possible. He drew the attention of an officer to it, who only remarked: "Yes, they *will* do it."

It might be thought that nowadays most people understood the proper use of filters on the Pasteur principle; it has, however, been found that in regimental soda water factories in India (managed and supervised by regimental officers), where the water was known to be dangerous, and in need of efficient filtration, the filter *bougies* have been fixed in such a way as to permit of the water passing through the joint, instead of through the wall of the bougie; this being done in order to get a more rapid flow; the "filter" is, of course, useless in such a case.

Although it is laid down in regulations that latrines are to be dug directly troops arrive in camp, this appears to have been neglected in several instances during the late war. Prof. Dunlop, in his evidence before the Hospitals Commission, considered that

no little blame was attachable to some commanding officers at bases (Modder River and Bloemfontein) who made little or no provision for the necessities of the soldier; no latrines were dug, and, when convalescing enterics were on their way to the base, the ground was fouled and the infection spread abroad.

At Pretoria a regiment was encamped on the racecourse, just at the outfall of the racecourse hospital, and the men were washing themselves in the drain water; a large extent of ground was available, but a camp was sited on ground that had been previously occupied and polluted, and just at the termination of a drain. No wonder enteric fever was prevalent among this body of troops. The regulations as to care in selecting a clean and healthy site are quite explicit, yet this was done; and in this, as in the other instances mentioned, there was no question of tactical considerations or military exigencies; it was merely a case of ignorance or neglect of well-known sanitary rules, that have been embodied and clearly stated in army regulations, but from time to time ignored by officers in responsible positions.

It must be admitted therefore that there is a real need for awakening officers generally to a sense of the importance of this subject.

The officers to be instructed fall into three categories: (1) the cadets at the two military colleges at Sandhurst and Woolwich; (2) officers of proved ability and experience at the Staff College; and (3) officers generally, of all degrees of age and service, stationed in different districts throughout the kingdom, or indeed wherever our army is serving throughout the world. It is obvious that a course of instruction suitable to the first will not be suitable for the second category of officers, and we will now note a few points, or leading ideas, that may be conveniently borne in mind in each case.

For the cadets at Woolwich and Sandhurst, perhaps the most important thing is to excite and maintain their interest in the subject. Now, it must be remembered that these gentlemen are young, and that they are not likely to be much interested, naturally, in such matters as latrines, drains, water supplies and disease prevention. They are entering His Majesty's Service full of the joy of life, inspired with martial ardour, eager to engage the visible foes of their king and country; "our business," they would say, "Our business is like men to fight, and hero-like to die"; one cannot expect them at first to embrace with enthusiasm the study

of sewage removal and water sterilisation. Nevertheless, if their interest can be stimulated, an impression may be made that will be of lasting value. Secondly, the truth must be forcibly impressed upon these young officers, that it is on them, combatant officers who will hold commands, whether of a company or of an army corps, that the responsibility for the health of the troops under them really rests; medical and sanitary advice will be at their disposal, but it is for them to see that the advice is acted on, the recommendations carried out.

A syllabus of six lectures has been framed, which will, it is thought, convey a general, even if very elementary, idea of sanitation as applied to military conditions. Commencing with the *Personal Hygiene of the Soldier*, the topics dealt with are his food, his clothing, drills and exercises, and particularly the training and development of the recruit. It will not do to try to enter far into the scientific and technical consideration of dietetics; neither would there be time to attempt this; but it should be possible to explain in simple language such fundamental matters as the nature and value of the different classes of alimentary principles; in what quantities they should be provided to form an ordinary diet; and what are the food-stuffs out of which such an ordinary diet can be composed. The actual food of the soldier may then be dealt with, and it may be explained that it is derived from the three categories of his ration (which is fixed), his messing (which is nowadays, speaking generally, most admirably managed by the regimental authorities, and is susceptible of considerable variety), and his private purchases (as to which information may be obtained from regimental institutes, &c.). It will be found that the soldier receives what is theoretically, as well as practically, an excellent dietary, at a cost to himself, out of his own pocket, of not more than a penny or twopence a day. The relation of food to work should be touched on; and a few plain words are necessary as to the use and abuse of alcohol. The subject of cooking must be alluded to, and the duties of regimental officers in relation to this, and to inspection of rations and messing arrangements generally pointed out. In this, and in all similar cases, it will be well to quote the actual paragraphs of the *King's Regulations*, or other official regulations or instructions, *e.g.*, the *Manual of Military Cooking*, the *Supply Manual*, &c. The class will find it worth while to take down these references for future use. In treating of this subject of dietary it is advisable to apply the *argumentum ad hominem*, and use any illustrations that may be derived from

the messing arrangements of the young officers themselves, who are being addressed.

The clothing of the soldier does not require lengthy consideration at the present time, as the articles of uniform, both in material and design, are, speaking generally, well adapted to the purposes for which they are required. A comparison may be made with the very unhygienic clothing of former days (tight stock, belts across the chest, &c.), though it is hardly likely that the pendulum of change will ever swing in that direction again. A few words will suffice to explain the value of woollen clothing, the need for protection to the head, &c. So with the drills and exercises of the soldier, which are now (in contrast with former days) carefully designed and carried out; and the training and development of the recruit; the need for caution against overdoing these exercises should be insisted upon. Lastly, some explanation may be given of the actual quantity of work that is performed by the soldier under different conditions, as compared with the amount of food supplied to him.

The next subject taken up is the *Hygiene of the Barrack*, including the general principles of plan and construction, cubic space and ventilation, cleanliness of the barrack-room, &c. The great advance that has been made during recent years in the design and construction of new barracks, accomplished at enormous expense, should be mentioned, with an explanation (accompanied by diagrams) of the points in which these improvements consist, *e.g.*, distributing the troops in several buildings, instead of aggregating them in one barrack block, as formerly; provision of dining halls, adequate cubic space, &c. (See a valuable paper, fully illustrated with plans of new barracks, by Major E. H. Hemming, R.E., *Progress in Barrack Design*, in Professional Papers of Corps of Royal Engineers, vol. xxvi., to be obtained separately from W. and J. Mackay and Co., Chatham, price 3s. 6d.). Ventilation can, of course, only be dealt with very briefly; the importance of not crowding more men into a barrack-room than the authorised number allotted should be insisted on; also the necessity for cleanliness in the room, opening the windows, &c. The water supply to barracks should be shortly described without going into technical details, the quantity allowed, avoidance of waste, and the dangers of cisterns, may be alluded to. As to drainage arrangements, it will be advisable to give as much time as possible to this part of the subject, explaining to the officers that, though an unsavoury topic, it is really necessary that everyone, if only for his own sake, should know something of the sanitary arrangements of his own house or

quarter. The construction of water-closets, latrines and urinals, the chief points in regard to manholes, traps, soil-pipes, &c., in the care of which the *troops* are concerned (as distinguished from details requiring the skilled supervision of the Royal Engineers) must be explained. Diagrams, or lantern slides, are absolutely necessary to make this either interesting or intelligible:* reference should be made to the valuable official handbook, *Instructions in the Care of Barracks* (price 9d.) It is of the greatest importance that officers generally should be brought to understand that it is *their* business to see that their barracks and lines are in good order in respect to these matters of drainage; just as every householder is responsible that his own house is in proper order; neglect of these matters very generally brings its own punishment in the shape of illness; the occurrence of any such illness, due to drain defects, must in some measure be laid to the charge of the officer commanding. It must be explained, by reference to King's Regulations and Royal Engineer Regulations, how far the responsibility of the officer commanding the troops extends.

The third lecture deals with *Hygiene of Camps and on the March*. The principal points to be considered in selecting sites for camps, providing water supply, and making suitable conservancy arrangements will be touched on. In this lecture the existing regulations contained in the *Manual for Combined Training* (provisional issue) will be explained; the great importance, and at the same time the difficulties, of obtaining a pure and wholesome water supply in camp pointed out; and hints given on camp sanitation generally, care of latrines, how to keep away flies, &c. As regards hygiene of the march, the rate of marching, care of the feet, arrangements for providing pure water, and food, with reference to Indian service as well as to manœuvres at home, will be shortly described.

The subject of *Tropical Service* is one that can easily be made interesting; it should be approached in such a way as to appeal to the young officers most forcibly, in their own interests, as well as for the sake of the troops under their command. Every medical

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* A good set of diagrams, measuring 40 in. by 30 in., is published by the *Hygiene Referendum*, 2, Gisburn Road, Hornsey, N., price, about 4s. 6d. apiece, or £4 8s. for the set of 25. They are prepared by Mr. W. H. Knight, formerly Curator to the Parkes Museum, and include Ventilation, Water Supply, &c., as well as Drainage. A small book of reductions of these diagrams, with full particulars, entitled "Diagrammettes," may be obtained, price 1s. Lantern slides can be obtained on hire, 3s. for 24 slides; apply for list to Secretary, Parkes Museum, Margaret Street, W.

officer who has served abroad knows how deplorably ignorant most people are, whether young officers or young soldiers, when going on their first tour of foreign service, as to the rudiments of personal and domestic sanitation. It has been said that to every regiment that arrives in India some experienced officers, non-commissioned officers and men should be attached for a short time, merely to give the newcomers advice as to what they should and should not eat and drink, and what they ought to do and to avoid doing, if they wish to keep fit; to give them, in fact, a series of tips day by day, in regard to accommodating themselves to life in India. Undoubtedly a great deal of good might be done by giving both officers and men some useful hints, such as anyone familiar with the country could do with ease; this would also apply to the other foreign stations where our troops serve, in each of which there may be some special points to be considered as regards keeping one's health. These hints would best be given immediately on arrival in the country, when advice would be more likely to be attended to than if given months or years beforehand. Failing any such arrangements, however, an hour can be profitably devoted, even in this preliminary course, to health hints for tropical service. First, as to feeding, what to eat, drink, and avoid, giving the reasons; and especially warning against bazaar-drinks, Bombay oysters, &c.; secondly, as to clothing, emphasising the main points as to protection of the head and of the abdomen; thirdly, warning against unnecessary exposure to sun, and to chill after exertion; caution as to the use of the cold bath, &c. A few words may be said about barrack arrangements; cleanliness of the lines, and especially of cookhouses, and protection of food from flies, being two most important points. Water supply and conservancy require to be more fully treated. Speaking generally, it will be well to advise that *all* water be looked upon with suspicion, from the point of view of drinking. As regards India, young officers should be strongly advised to look to the protection of the wells, and to the conservancy arrangements *of their own bungalows*, and to the cleanliness *of their own cookhouses*. It will be well to press the *argumentum ad hominem*, and point out to them how much their own comfort and well-being will depend on their exercising care and discretion in these matters of their own diet and clothing, and, in fact, how necessary it is to be temperate in all things while living in the Tropics.

A few words in this lecture may be devoted to hygiene on board ship; ventilation, exercise, moderation in eating and drinking, &c.

The *Prevention of some Common Diseases* applies principally to the diseases of warm climates, and follows naturally on the preceding lecture. The most important diseases to be spoken of are enteric fever, cholera, plague, malaria, sunstroke, and abscess of the liver. It will not be difficult for any medical officer who has served abroad to bring from his own experience examples of what should, or should not, be done in the prophylaxis of these diseases. Without being too scientific, or too technical, a clear *reason* for taking certain precautions should be given; for instance, why one should not take any exertion on an empty stomach during a cholera outbreak; but, on the contrary, always break one's fast before going out in the morning (absence of gastric juice in the stomach favouring the multiplication of *spirillum choleræ* if ingested); why cleanliness of houses, fresh air and sunlight, are great preventives against plague (*B. pestis* flourishing in dark and dirty corners, and speedily dying on exposure to sunlight); why ague follows on exposure to "miasm" at night or in the early morning (mosquitoes most active at those times), and so on.

In this lecture advantage should be taken of the opportunity for explaining in general terms the *modus operandi* of the causes of infective disease, and in what these actually consist; that is to say, that most infective diseases are due to certain particulate micro-organisms, and not to vague influences or miasms. It may be pointed out that just as an enemy who is unseen, and whose strength is unknown, is more difficult to contend with than one that is in full view and whose dispositions are well understood; so, in fighting any disease, the first essential is to ascertain its *actual cause*. When this is known, scientific measures of prevention (that is, measures that will be effective, because they are adapted to a particular purpose, and not taken at random) can be carried out. The micro-organisms of, at any rate, enteric fever, cholera and malaria should be described and shown, either by diagrams or by lantern slides, or perhaps, best of all, by living cultures under the microscope. This will be found to interest the class considerably. Some general observations as to the life history of micro-organisms, and the great ease with which they can be killed, will naturally lead to the enunciation of a few simple rules of the greatest importance in *practical* hygiene, such as those mentioned above.

The last lecture, on hygiene applied to *Service in the Field*, should gather up all the essentials in the preceding lectures, and show in what way, and to what extent, those measures of sanitation which are acknowledged by everyone to be beneficial and necessary,

during peace time in barracks, can be carried out under the stress and strain of war. One cannot expect to be able to take all the precautions that one would like to take; what are those that are really essential and really practicable? At the present time our commissariat and supply arrangements are so admirable that there is no need to dwell at length on the question of food for the soldier on active service; the two great problems to be considered are provision of pure drinking water supplies, and proper disposal of excreta and refuse matter generally. Each of these presents great difficulties. With regard to water purification, sterilisation by heat, as by the Forbes-Waterhouse, or Leigh Canney, or other methods; and filtration on the Pasteur principle by Chamberland, Berkefeld, or other similar filters, should be described; the necessity for a previous clarification, if the water be at all turbid (so frequently overlooked in South Africa), must be insisted on, if Pasteur filters are used; also its desirability in all cases if practicable. It must be admitted that *no one method* of purification can, at the present time, be put forward as practicable and suitable under all conditions of active service; sometimes heat, sometimes filtration, will be the best, in either case the actual *modus operandi* offers difficulties, which can only be overcome by the most careful attention to numerous details. The greatest hope of success must be derived from a thorough appreciation of the importance of the matter by combatant officers generally; when they realise this fully they will heartily co-operate with the efforts of the medical and sanitary authorities; in this instance, perhaps, more than in any other, is there need for clearly laying down the responsibilities of the combatant officers, commanding units, for thoroughly carrying out whatever system of purification is considered most advisable under any particular conditions. The necessity for detailing men specially for the duty of obtaining and purifying water for drinking purposes seems to be a real one, and as urgent as the detailing of men to act as cooks; if filtering processes or heat sterilisation are required, the men who are charged with the duty require special training, and should always be available for this duty. As to latrine arrangements, removal of refuse and camp conservancy, the existing regulations lay down what is required; the difficulty is, strange as it may appear, to get these regulations carried out under active service conditions (*e.g.*, want of provision of latrines at Bloemfontein and elsewhere); this is due to a want of appreciation of the importance of the subject by combatant officers generally.

Supposing the interest of these young officers has been excited

in these subjects, some at any rate of the facts presented, and of the recommendations made, will sink into their minds and be of use afterwards; the important points must be *dwelt upon*, even to reiteration; the practical aspects will, of course, demand chief attention, but, whenever possible, the *reason*, the scientific groundwork, for any particular recommendation, should be stated and explained. In this way mere dogmatism will be avoided, and the lectures will be made much more interesting and profitable. Any illustrations from personal experience will of course add to their reality and have the same effect.

The lectures for Senior Officers, such as those at the Staff College, must naturally differ from those we have been considering, not perhaps in their subjects, but in the way these subjects are treated. The interest of the officers must be excited and maintained in these, to some of them not particularly attractive, matters for study; as a rule, however, the more senior and zealous officers do possess some idea of the importance of army sanitation; though unfortunately (as shown over and over again during the late campaign) many were not sufficiently alive to this importance when face to face with the excitements and fatigues of actual warfare. One of the best ways of making this senior course profitable will probably be to *elicit the experience* of the individual officers as much as possible; all will have served abroad, and nearly all will have had actual experience of field service. The time spent in actual lecturing may be shortened, and as much time as possible given to individual and personal instruction; that is, the answering of questions, the solving of difficulties officers may have felt in such and such circumstances, the explanation of probable causes of any disease-outbreaks or cases of illness that have been impressed on the minds of officers, any illnesses of their own, for instance. Much information may be imparted in this way, and when so given, *individually*, is more likely to be remembered than when given to a whole class generally: it is the *argumentum ad hominem* again.

As these officers have all had more or less experience, the subjects of Personal Hygiene of the Soldier, Hygiene of the Barrack, and Tropical Service require to be treated from a standpoint different from that taken in the elementary course; and as the time is necessarily limited and everything cannot be dealt with in detail, the syllabus lays down the three topics of Water Supplies, Food of the Soldier, and Removal and Disposal of Excreta and Refuse, as those on which as full a consideration as possible may be of most use.

Under the head of *Water Supplies*, the nature of the different sources of water, rain, spring and deep well water, water from shallow wells, river water, may be explained; the pollutions to which water is liable, and how to guard against them; methods of collection and storage; methods of purification; these are headings under which the most practically useful facts and recommendations may be conveyed. Under the head of *Food*, a very brief outline may be given of the nature and value of the different kinds of foodstuffs in universal use; bread, meat, bacon, cheese, potatoes, &c.; compressed and concentrated foods, &c.; then an explanation of the relation between the amount of food given and physical work required to be done; comparison between the British soldier's ration and the rations of various foreign armies.

The subject of *Removal of Excreta, &c.*, and their disposal is not attractive to most combatant officers, and is one that they often dismiss as much as they can from their thoughts, looking upon it as the business of the medical officer and the quartermaster. This view must be combated, and endeavour should be made to bring officers to acknowledge that it is as much their duty to take care that the latrines and drainage arrangements belonging to their respective units are in good order, as it is to see that their men are efficient at drill, and that the regimental or company accounts are properly kept. An outline of the principal points in drain construction, not details of engineering, but such as come under the cognisance of troops occupying barracks, and with which all officers ought to be familiar (though generally the reverse is the case); and a sketch of what is intended to be done in modern methods of sewage disposal, not entering into any scientific or technical details, but giving a general idea of the *principles* of the biological systems now so frequently adopted in barracks and camps, will be of considerable use. This subject, however, it must be confessed, is rather hard to make interesting to a non-professional audience.

The three remaining lectures on "Hygiene of Camps and on the March," "Causes and Prevention of some Common Diseases," and "Service in the Field," cover practically almost the same ground as the three corresponding lectures in the junior course. The chief differences in treatment will be, *first*, to elicit from the officers their own experience as much as possible, and use that as a text, so to speak; *secondly*, to refer more particularly to the work of the Staff, and in what way Staff officers may co-operate with the medical authorities in such matters as dealing with epidemics of disease, in the disposition of camps, regulation of marches, &c.

In addition to the above regular courses given by specially selected officers, the sanitary officers recently appointed have been instructed to deliver short courses of lectures at convenient times to Staff and regimental officers in the various districts. Attendance on these classes will be voluntary, but it is thought that many officers will avail themselves of the facilities thus offered for obtaining some knowledge of a subject that has occupied such a large share of public attention lately. Supposing the subjects sketched out in the foregoing pages were chosen as being suitable for these lectures, they would probably best be treated in some manner intermediate between the two plans above detailed. Some of the officers would be quite young and inexperienced (like the cadets); others, perhaps the majority, would be older and of considerable length of service and experience. The lectures to each class would have to be prepared with special reference and adaptation to the character of the audience, in order that the greatest amount of practical good may be got out of them; but in any case there can be little doubt that the main things to aim at are to make the lectures interesting, to make them practical, and to get in touch with the officers individually as much as possible by eliciting their experience and turning it to advantage.

All these lectures require to be illustrated by diagrams or lantern slides. Diagrams can perhaps be obtained or prepared locally; in case of any difficulty a very useful and trustworthy set of diagrams covering nearly the whole subject of hygiene (but not with reference to military requirements especially) is that known as Knight's series, prepared by a former Curator of the Parkes Museum (see p. 710, footnote). Diagrams of barrack designs on the latest principles may be prepared by enlargement from the plans in Major Hemming's paper, mentioned above (p. 709).

RAIN-QUAIL (*COTURNIX COROMANDELICA*) SHOOTING.

By Major J. FAYRER.
Royal Army Medical Corps.

For the all-round sportsman India is still an ideal country, and every month of the year offers some attraction to the Nimrod. Whether in cantonments, on the line of march, or in the hills, we have all experienced the absolute *joie de vivre* consequent on a good day with the gun or rifle.

In cantonments the early drive to the "Jheel,"* the first glimpse of which often promises a good day with the duck, the environments of which speak eloquently of the unsuspecting, but wily snipe. The rest and lunch, under a shady tree, contemplating the morning's bag, then more shooting, and a pleasant drive home, feeling healthily tired, satisfied and hungry.

In the hills, the early rising in the dark, followed by a brisk walk to the hill-tops, and when there the glorious sight as the shadows gradually, but quickly, give way to the advancing lights, till presently the whole scene is flooded in sunshine. The bitter cold experienced during the rising of the sun is almost forgotten when one hears in close proximity evidences of the presence of the kalij or koklas,† the chakor,‡ or black partridge.§ Or, if a morning with the rifle has been selected, the peep from behind a friendly crag of the pretty little barking deer, or the wily gooral partaking of an early breakfast. Then as the cold weather passes and the hot season commences, pig-sticking and big-game shooting may be indulged in.

As a result of the heat, the whole surface of the continent becomes hotter than the sea, and the rarefied air rises and is replaced by the cooler currents drawn in, laden with moisture, from the sea. The result is the monsoon. Then—rain! rain!! rain!!! The rainfall varying in amount in different localities, according to the direction of the monsoon and local meteorological conditions.

During this season the prospects of sport are not so good. Pig-sticking can occasionally be enjoyed, and fishing in the lakes can be indulged in. Generally speaking, however, the gun is laid aside and the enervated sportsman is inclined to go the way of all flesh, and become lazy and bored; and small blame to him, perhaps, consider-

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* Swamp. † Two varieties of pheasant. ‡ Hill partridge.
§ Found in the plains and hills up to about 4,000 feet.

ing the conditions of climate in which he has to drag out his existence; a climate so well defined in Milton's description of a trying climate:—

> "For hot, cold, moist and dry, four champions fierce
> Strive here for mastery, and to battle bring
> Their embryon atoms;"
>
> —"Paradise Lost."

The above rapid and cursory review brings us, then, to the "rains," and my object in writing this article is to introduce a very sporting little bird which visits most of the "Plain" stations of India, certainly of Bengal during this season—I mean the rain-quail —and to show that my statement, that every month of the year offers some attraction in the way of sport, is a truism.

When I speak of introducing the rain-quail, I do not wish to imply that I am an ornithologist, proud of the discovery of a new species; I fancy we all know the rain-quail, but I do claim originality, in that I discovered, quite by chance, a new method of shooting our little friend.

Of the many species of quail to be met with in India, this little bird (*Coturnix coromandelica*) is, I think, the handsomest. Its colouring, generally speaking, is like the common quail (*Coturnix communis*), but its neat and natty appearance is enhanced by the addition of brilliant black feathers on face, throat and chest. The amount of black feathers on the chest increases with age till, in old birds, nearly the whole breast is black.

The rain-quail is a resident or partially migratory bird, found throughout the greater part of India and in the Irrawaddy Valley in Burma. It has not been met with in Ceylon or the extreme South of India. It is not known to occur outside the Empire (Blanford). Although resident in many parts of India, it shifts its ground with the season, and it only visits Northern Bengal, the North-West Provinces, &c., &c., during the monsoon, hence its patronymic.

The places where I have met with this species are Muttra, Cawnpore and Sitapur, but the visits, as I have shown, are by no means confined to these stations.

Shortly after the rains have set in, and the grass has assumed a considerable length, the sharp, unmistakable call of the cock bird may be heard issuing from all directions. They are peculiar in their habits as regards the locality they visit. For instance, in the year 1890, the racecourse at Muttra (within half a mile of cantonments) was full of them, and for some weeks on the racecourse alone I had excellent sport, bagging as many as fifteen to twenty couples in an hour or two, two or three times a week. After the rain fell the following year I looked forward to good sport on

"my" racecourse—not a bird existed! Also, the familiar call was sadly wanting in the country round.

These birds are generally found in the long grass, but also in the young grain crops environing the field or maidan. Their absence from certain localities in one season, and their crowding the same locality during another, depends, I think, on the presence or absence of the food they like. In fact, in addition to the seed, &c., they may get from the grass itself, they prefer a grass field bordered by young crops. As a rule, I have shot these birds, either alone with a few "coolies" to form a close line, or with one or two more guns disposed at close intervals between the coolies. As you walk slowly along you will presently hear the familiar, sharp and distinctive call of the cock bird, "twit-twit, twit-twit"; this is very soon answered by another, till presently, from all directions, the air is full of the sharp note. When the birds are in profusion like this, you simply walk slowly all over the field, and at short intervals will flush a bird; and in a great fluster and flurry does he get up, flying off low down, but always in a straight line, whatever the direction, there is no twisting or turning. His flight, as a rule, is a short one and down he settles, to be flushed again, if he has escaped the charge of No. 8! As a rule, then, during the rains you will find our little friend, if not in one locality, then in another. But it is possible, as I shall show, if the birds are not plentiful in one place, to induce them to come together; and this is a form of sport, as far as I know, new to most, real sport, and which I quite accidently discovered. In 1897 I was stationed at Cawnpore during the Frontier trouble, and was doing very hard work. This necessitated sticking closely to the mill; so much so, that I could only occasionally spare from an hour to an hour and a half to devote to my favourite amusement—shooting. About half a mile only from my house, and bordering on the native cavalry lines, was a large grass field well grown with grass, and containing, as my ear told me, at any rate, some rain-quail. Having only such a short time at my disposal to go out shooting I considered whether it was worth while going out at all. Then it occurred to me, that under the circumstances "call birds" would be advisable and justifiable. I at once sent my bearer off to the "bazaar" to ask a man to bring some call birds.

Before long my bearer announced two half-clad Aryan brothers, who said they understood all about calling the birds. I gave them the order to go out to "my" field and locate the call birds, and let me know when all was ready. To my astonishment they said they did not keep call birds, but did the calling themselves. So I went

into my room and told them to go into the garden and give me an exhibition of their powers. In one minute the place seemed alive with quail, the two men alternately imitating the familiar call. Not only this, but they modulated the tone, apparently making the sounds come from far and near. I have never heard anything better done. I now told them to go off and call some birds up, and I would follow in an hour or so. They said: "No, sahib, come along with us now; you will see there is no necessity to call the birds first." I immediately ordered my trap and drove off to the field with gun, No. 8 shot, and game stick.

In one hour I had bagged fifteen couples of birds.

This is how my human "dogs" conducted the sport. On arrival at the field we stood for some minutes in one spot, and both men commenced calling; before long they were answered, then I was ordered to proceed, a man on each side of me. As we went they still continued calling. Then suddenly one man said, "This way, sahib," and sure enough, whenever he gave this "order," before I had gone many yards, a bird would rise. It was good sport, and most interesting. These men, I discovered, were professional quail-catchers, earning their livelihood by netting quail. This is how they set about it. They go with their nets into a field, and, standing in one spot, they frequently imitate the cock bird; then suddenly they make the peculiar chirruping sound of the female. Although they can see nothing, they know that as soon as the cocks hear the imitated female they come running along, heads down, towards the sound, and into the nets placed for their reception. Male and female come, the former rushing to the fatal imitated sound, and the females accompanying their faithless lords. From this description it will easily be understood that when shooting with these men you are sure of some sport. It much resembles shooting with dogs, and is, I think, more sporting than putting out call birds. I do not know whether this kind of sport is familiar to any of your readers. So far, out in India, I have met none who have tried it, and these lines are written in the hope that others like myself may be able to get some fun with the least possible expenditure of time and trouble.

I would add that in almost every bazaar you will find these professional birdcatchers, and if they do not understand exactly what you require, it is a very easy matter to teach them. Their imitation of the "call" is perfect, and you have only to explain what you require them to do. Very soon they will become quite expert "dogs."

ON THE EFFECT OF DRYING AND OF EXPOSURE TO THE SUN OF THE TYPHOID BACILLUS UNDER INDIAN CONDITIONS.

By Capt. W. S. HARRISON.
Royal Army Medical Corps.

And Capt. L. W. HARRISON.
Royal Army Medical Corps.

The following experiments were undertaken with a view to determining how far the results obtained by Firth and Horrocks,[1] after drying and after exposing the typhoid bacillus to the sun, were applicable under Indian conditions.

In each case dry dust (of which there is always a too plentiful supply during the greater portion of the year in the Punjâb) was taken; the dust was sterilised to reduce to some extent the subsequent complications in working, it being considered improbable that there would be any interaction between the various bacteria present under the conditions of absolute dryness which would prevail after the first few hours of the time during which the experiments were taking place. Petri dishes filled with this dust to a depth of half an inch were each contaminated with a tube full (about 10 c.c.) of a growth of typhoid bacilli in fresh human urine. The dishes were left uncovered and exposed to the conditions below named, and as soon as they were dry, and every few hours thereafter, cultures were made from the surface of the contaminated earth into nutrient broth. The cultures were incubated at 37° C. for twenty-four hours and then examined; if likely motile bacilli were seen a loopful of the culture was diluted with 10 c.c. of broth or normal saline solution, and stroke cultures from the resulting mixture were made on agar plates; these plates were examined after twenty-four hours' incubation at 37° C.; all likely looking colonies were picked and a small portion rubbed up with normal saline solution. Half of the resulting emulsion was mixed with an equal quantity of a 1-50 diluted anti-typhoid serum, which was known to agglutinate typhoid bacilli in a maximum dilution of 1-400, and the remainder of the emulsion was kept as a control; if the serum produced agglutination of the bacilli within half an hour and the bacilli in the control remained free and motile, the colony

from which the specimen was taken was planted into broth, the resulting culture being kept for identification at leisure.

The following standard was taken as that of a typhoid bacillus in each case :—

(1) A non-sporing, actively motile bacillus, not staining by Gram.

(2) Giving a diffuse growth in broth without either pellicle or deposit.

(3) Giving a thin, moist, greyish white growth on agar slope.

(4) Not liquefying gelatine.

(5) Giving a typical colourless growth on potato.

(6) Growing in glucose shake gelatine without production of gas.

(7) Growing in peptone and salt solution without production of indol.

(8) Failing to clot milk after a week's growth.

(9) Agglutinating in less than half an hour with a 1 in 100 diluted anti-typhoid serum, a serum which agglutinated typhoid bacilli in a maximum dilution of 1 in 400.

The experiments were carried out at Kasauli, which shares the dry climate of the Punjâb during the greater portion of the year.

Experiment 1.—Petri dishes filled with dust to a depth of about half an inch were each contaminated with a tube (about 10 c.c.) of a twenty-four-hour culture of typhoid bacilli in fresh human urine. The lid was left off and the dishes exposed to diffused light in a room. Time of the year, March.

Result.—The mixture was dry enough to be raised as a cloud of dust, when the surface was disturbed, in five and a half hours.

Typhoid bacilli were recovered from the dust after 118 hours, nearly five days.

Experiment 2.—Petri dishes filled with dust and contaminated with typhoid culture in urine. As in experiment No. 1, they were left uncovered and exposed to the sun daily from 10 a.m. to 4.30 p.m. Time of the year, March.

Result.—The mixture was dry enough to be raised as a cloud of dust after two and a half hours.

Typhoid bacilli were recovered from the dust after seventy hours, during seventeen and a half hours of which the dust had been exposed to the direct rays of the sun.

Experiment 3.—Petri dishes filled with dust to a depth of about half an inch were each contaminated with a tube (about 8 c.c.) of a forty-three-hour growth of typhoid bacilli in fresh human urine. They were then left open and exposed to the sun daily from 10 a.m. to 4 p.m. A thermometer buried in a similar dish full of dust and

exposed under the same conditions gave an average temperature in the sun of 53° C. Time of year, June.

Result.—The mixture was dry enough to be raised as dust after three and a half hours.

Typhoid bacilli were recovered from the dust after seventy-seven and a half hours, during twenty-three hours of which the dust was exposed to the direct rays of the sun.

Remarks.—The result of experiment No. 1 approximates those obtained by Aldridge[2] in India. He recovered the typhoid bacillus from earth contaminated with the urine of patients suffering from typhoid bacilluria on the first, fourth and ninth day of drying. In his experiment he refreshed the soil with the infected urine on three successive days. Firth and Horrocks recovered the bacillus from dry earth up to twenty-five days after complete drying. The shorter time after which we succeeded in isolating the bacillus from dry earth may be partly explained by the less perfect technique which we adopted, and partly by the fact that dessication is much more rapid and complete in the Punjâb than it is in England, as is shown by the extremely short time that it took for the well-wetted dust to be dried again into dust. It also shows, we think, that, at any rate, the preliminary sterilisation of the soil did not encourage the survival of the typhoid bacillus.

The results of experiments 2 and 3 show that typhoid bacilli survive exposure to the sun in India for a much shorter time than Firth and Horrocks found to be the case under the same conditions in England.

But all the experiments show, at any rate, that typhoid bacilli will survive, potent for mischief, in Indian dust and under an Indian sun sufficiently long to be blown through and through barracks and camps when deposited on the ground in the form of typhoid-infected urine, or blown as infected dust from the dry earth used in the latrines. The practical importance of these facts in relation to conservancy in India is obvious.

References.

[1] *British Medical Journal*, September 27, 1902.
[2] *Indian Medical Gazette*, July, 1908.

AN AMBULANCE HAMMOCK FOR HILL WARFARE.

By Major A. R. ALDRIDGE.
Royal Army Medical Corps.

In hill warfare there is often great difficulty in removing wounded men by means of the ordinary dandy or stretcher, and small detached parties often find themselves without even these, or without sufficient of them.

The chief desiderata for an ambulance for hill work seem to be: (1) The total length, including bearers, should be short, to allow of zig-zagging among rocks; (2) it should be well above the ground to avoid irregularities of this during ascents and descents; (3) it should be so constructed that the patient cannot fall out; (4) it should be very light and easily carried when not in use, so that small detached parties may be provided with a means of removing their wounded without being encumbered with great extra weight, or even with special bearers.

The hammock shown in the following illustrations was devised as an attempt to fulfil these requirements. It is made of canvas and supported by canvas bands arranged at suitable positions to carry the weight. Leg-boards are provided to support the lower limbs in cases of fracture. These can also be used as splints.

When folded the hammock is easily carried slung over the shoulders (fig. 1). An unjointed pole is shown in the photograph. The jointed pole is carried strapped to the hammock. Two bearers can carry it at full length by means of a jointed pole (fig 3), or with the patient in a sitting position by means of rifles or the short poles, either in the hands or on the shoulders (fig. 2). With four bearers it is best carried by the two short poles or two rifles placed obliquely through the loops, but for long distances over fairly level ground two long poles can be used (fig. 4).

The weight of the hammock is:—

	lbs.	oz.
Hammock	5	0
Leg-boards	2	6
Traverse	1	0
Jointed pole	6	10
	15	0

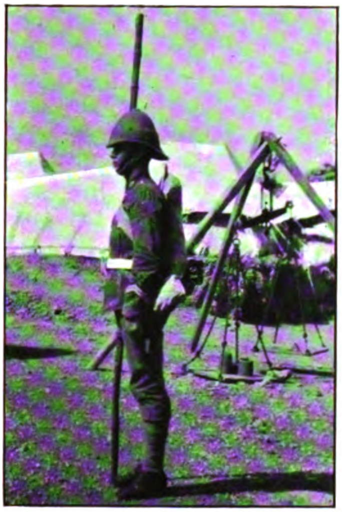


Fig. 1.

Fig. 3.

Fig. 2.

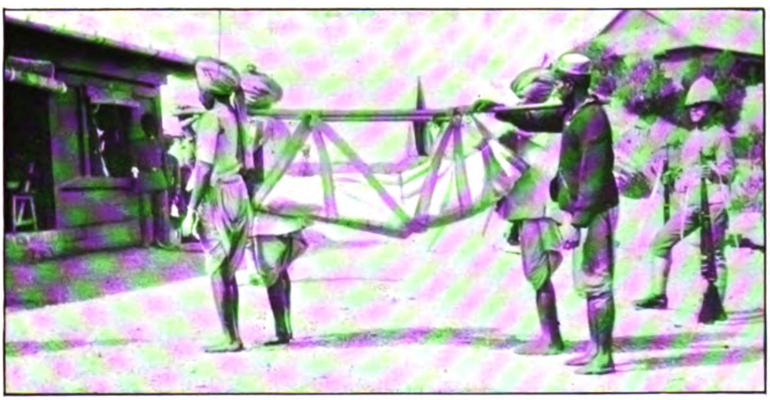


Fig. 4.

The total length when folded is 5 ft. 3 in., it can therefore be easily carried by pack transport, ten hammocks with poles constituting one mule load.

This hammock was tried during the Chinese Expedition of 1900, together with three other patterns of stretchers, by Capt. W. G. Richards, I.M.S., who reported that it was the most successful hill ambulance. The opportunities of testing it, however, were small. It is now being tried with the Thibet Mission.

INTESTINAL PERFORATION IN TYPHOID FEVER ON ACTIVE SERVICE.

By Major F. HEUSTON, C.M.G.
Royal Army Medical Corps.

To the January number of the *Annals of Surgery* Dr. R. H. Harte and Dr. A. P. C. Ashurst contribute a very able article on intestinal perforation in typhoid fever, and give instructive statistics on operation.

After reading the above article, and in view of the attention which the profession are now devoting to the subject, I am induced to refer briefly to the few cases which came under my personal observation during the late war in South Africa.

Of the large number of cases of enteric fever treated during the years 1899 to 1902, when I was in medical charge of the 4th Brigade Field Hospital and No. 15 Stationary Hospital at Heidelberg (Transvaal), only three cases of perforation occurred, and all of those towards the close of the war. The patients in all these cases were transferred to me from mobile mounted columns; the men were therefore, in very hard condition, engaged in harassing work, entailing long rides, exposure and poor food, while there was a probability of the patients have ridden long and far whilst suffering from the early stages of the disease. Detailed accounts were furnished at the time to the Surgeon-General in South Africa; they were also entered in the case-books of No. 15 Stationary Hospital, but as these were returned to headquarters with the other documents at the close of hostilities I am unable to give details of the cases, and therefore write broadly from memory.

The first case was some seven days in hospital and appeared to be progressing favourably, but the patient suddenly collapsed and complained of abdominal pain at 11 p.m. I saw him (in consultation with Lieut. Gill, R.A.M.C., who was in charge), and decided that rupture had occurred, and that operation was necessary, but, owing to the difficulty of providing sufficient light in our windy operating tent, it was decided to postpone operation until daylight. The case was carefully nursed through the night, and the operation performed early in the morning. A good deal of peritonitis was present, but no difficulty was found in reaching the lesion, which was a clean-cut opening the size of a pea, some eight inches above the ileo-cæcal valve, situated at the centre of an inflamed Peyer's patch. The inflamed portion of the patch was excised and the opening sutured; the peritoneum was washed out and irrigated with warm

neutral saline solution. Two other large patches were seen to be inflamed and superficially ulcerated, but did not show symptoms of perforation. The wound was closed and the patient left the table after some thirty-five minutes with improved pulse and seemingly stronger. He continued to improve for some hours, but towards evening he gradually sank and died. The *post mortem* showed that the gut was air and water-tight, and that the peritonitis and congestion of the intestines had almost disappeared.

Immediately on conclusion of the above operation I was called to see another case, and to my surprise again diagnosed perforation, which had come on whilst we were engaged in the previous operation. This case had also not been long in hospital, and was considered a case for favourable prognosis. Immediate orders were issued to prepare for operation, but owing to an attack by the Boers on our cattle guard I was called away (as senior medical officer) to make arrangements for our wounded, and did not return until early next morning, when I found the patient had collapsed, and he expired shortly afterwards. *Post mortem* showed a small perforation of the ileum, through the centre of a small inflamed Peyer's patch, no other patch was inflamed, and the peritonitis produced by the exuded contents of the gut was localised. This would have been a most favourable case for operation, and I much regret the unexpected call for our services which made operation impossible.

The third case occurred about a month later. From the first the disease was of the most severe and unpromising type, and about the end of the third week evidences of perforation with extreme exhaustion appeared. In consultation with the medical officers it was agreed that the patient was not a fit case for operation owing to his severe prostration and evidences of extensive disease. He died some hours later, and the *post mortem* showed most extensive inflammation of the large and small bowel, with rupture of a Peyer's patch the size of a crown piece, and also ulceration of numerous other patches; besides which some six inches of the ileum was congested, black and gangrenous.

In conclusion, it would appear that at present accurate statistics on this subject are most urgently needed, and, as all cases of enteric fever occurring in the army are carefully recorded, and all fatal cases subjected to *post-mortem* examination, the publication of such reliable statistics giving the number of cases, the number of deaths, and also the number of the latter in which the intestines were perforated, would prove of much interest and importance to the civil members of the profession, who are in very few cases able to obtain permission to have a *post-mortem* examination.

Clinical Notes.

AN UNUSUAL COMPLICATION OF APPENDICITIS. OPERATION. RECOVERY.

By Capt. A. CHOPPING.
Royal Army Medical Corps.

I. H., aged 22 years, gunner, an unhealthy-looking man, was admitted to the Station Hospital, Rawal Pindi, India, on the morning of October 1, 1903.

He complained of a fairly constant pain in his right iliac fossa and in the region of the umbilicus. There was also slight tenderness on palpation, but no tumour could be felt. His bowels were acting normally every day.

For the next four days patient had a rise in temperature each evening to about 101°, falling to 99·2° in the morning, and at times he sweated profusely. The abdominal pain and tenderness continued notwithstanding treatment, but no tumour or distinct resistance could be felt. His tongue now became thickly coated, and his pulse increased in frequency, but was full and strong.

On the evening of October 10 there was distinct resistance in the right iliac fossa, but no definite tumour could as yet be made out. The next morning, October 11, a definite, sausage-shaped swelling could be felt in the right iliac fossa, which was very tender on palpation. Difficulty in the diagnosis of the case arose as to whether it was an ordinary case of appendicitis, or of intussusception, or obstruction by adhesions. As the patient's case was grave it was decided to operate at once.

The patient was therefore put under chloroform at 2 p.m., and an incision five inches in length made over the tumour. On opening the peritoneal cavity the cæcum was found to be bound down to the posterior abdominal wall by adhesions, and the gut above it was very distended. In breaking down some adhesions, searching for the appendix, a small abscess containing the appendix was opened, and about one ounce of pus escaped. The appendix was in a gangrenous condition, and it was found impossible to apply a ligature on healthy tissue. As much as possible, therefore, was removed, and a long ligature left on the stump. The wound was stitched up and a glass drainage tube left *in situ*.

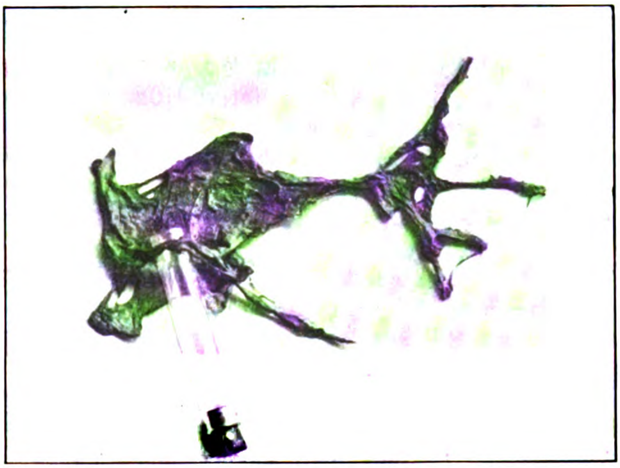
October 12.—Patient had severe pain in his abdomen last night. Profuse serous discharge through drainage tube, pale yellow in colour. No abdominal distension. Tumour referred to above can still be distinctly felt.

October 13.—Abdominal pain much less, discharge still serous. He has had one stool, containing bile. Pulse 96. Tongue moist.

October 14.—The discharge from the wound has become purulent. The bowels have acted seven times during the last twenty-four hours.

The stools are small in quantity and contain bile, and probably represent the contents of the tumour, which has become much reduced in size.

October 16.—Profuse discharge of pus and fæcal matter from the wound. Bowels have acted five times during the last twenty-four hours, and he has passed a large slough per rectum.



On microscopical examination this proved to be a portion of the gut, but which portion it was impossible to determine, as it had become partially disorganised. The abdominal tumour and pain have entirely disappeared.

From this date patient made rapid progress towards recovery. The portion of the appendix left behind at the operation came away through the wound on October 24. The fæcal fistula closed from the bottom and patient was well by the end of November, having put on over two stones in weight.

MALTA FEVER IN ENGLAND.

By Capt. F. M. MANGIN.
Royal Army Medical Corps.

The following brief extract of a fatal case of Malta fever is, I venture to think, one of great interest, as the disease occurred in a patient who had never been abroad.

The patient, a gunner of the R.G.A. at Dover, aged 22, with one and a half years' service, reported sick November 29, 1903, complaining of abdominal discomfort and general malaise. The evening temperature was found to be 103·8°. On admission no definite physical signs, either in the thorax or abdomen, could be made out. The urine was in all respects normal.

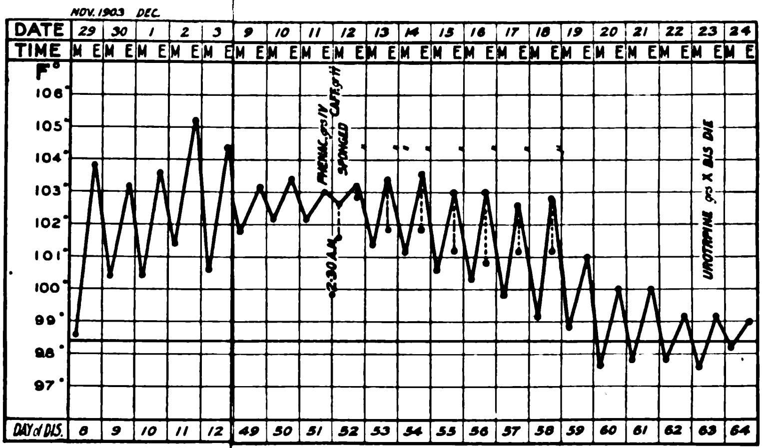
Ten days after admission the spleen was perceptibly enlarged, and tender to palpation. The temperature throughout the illness was typically undulant, rising by 0·4° to 0·6° till the eleventh day after admission, when it gradually sank till it reached normal on the twenty-first day. On the twenty-eighth day it again began to rise, reached a maximum of 102° on the thirty-second day, and again fell to normal on the thirty-ninth. The following day the temperature again began to rise, reaching its maximum of 104·6° on the forty-sixth day, and gradually fell to normal on the sixty-fourth day. Another rise of temperature again took place, the maximum, 105°, being reached on the seventy-fourth day, with a fall to normal on the eighty-fourth day of the patient's illness. The next pyretic attack, which followed immediately on the previous one, reached its maximum of 103·2° on the one-hundredth day, falling to normal on the evening of the one hundred and sixteenth day. The patient died of exhaustion and cardiac failure on the one hundred and twenty second day of the disease.

Widal's test was applied on the seventeenth day after admission, with no result, either in hanging drops (dilution 1 in 30) or sedimentation tubes. The blood was repeatedly examined microscopically (films stained by Leishman's modification of Romanowsky's stain) and at no time was any leucocytosis to be found. On January 17 a film of urinary sediment (derived from urine recently passed, acid in reaction) was stained with gentian violet, and on examination showed numerous extremely minute cocci. On January 28 (sixty-eighth day of illness) the patient's serum was tested against a dead culture of *Micrococcus melitensis* obtained from Major Leishman, R.A.M.C. "Clumping" was well marked both in hanging drops (1 in 30 dilution) in less than thirty minutes, and in sedimentation tubes with dilutions of 1 in 30 after twenty-four hours; a control of normal salt and *M. melitensis* being also used as a standard.

Throughout the patient's illness vague muscular and articular pains were complained of, but no effusion into the joints took place, nor were the testicles affected.

Quinine had no effect on the temperature, and other antipyretics proved unsatisfactory. The pyrexia was best controlled by tepid sponging.

Post mortem.—The body was much emaciated as the result of the prolonged pyrexia, its estimated weight being a hundred and twelve pounds. The lungs, pleural cavities and heart were normal, except that the latter was small and weighed about eight ounces. The bronchial glands were much enlarged, to three or four times their natural size. The stomach and intestines were healthy, with the exception of the Peyer's patches, which were slightly engorged. The liver was enlarged and fatty, weighing ninety ounces. The lumbar glands were normal. The mesenteric glands here and there were slightly enlarged and calcareous, possibly the result of a post-peritoneal tuberculosis. The spleen was enlarged, congested, toughened, and "sago grain" in appearance on section. The remaining organs of the body, bearing in mind the long-continued pyrexia, were normal.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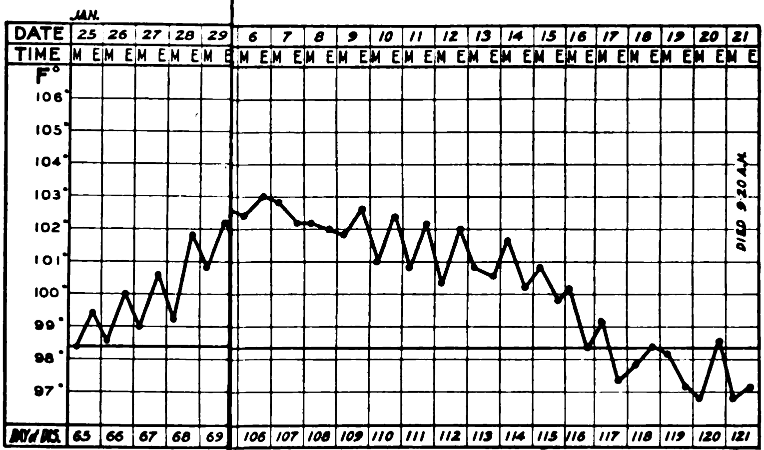
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Editorial.

MALTA FEVER. PART II.

Effect of the Micrococcus melitensis on Man.—When the micrococcus has gained entrance to the human organism, by whatever route, nothing to be marked happens for some days. This period of incubation is fairly well known on account of a number of accidental inoculations which have taken place in laboratories. When the exact date of the inoculation was known, fifteen days elapsed before the fever declared itself. This then may be taken as the most usual period of incubation. Other evidence, but which is not nearly so strict, is afforded by the occurrence of fever in troops landing from England. In this way cases have been recorded as beginning six, eight, ten and fourteen days after arrival in Malta. In the same way cases have been given of Malta fever arising in England in persons who had left Malta fourteen and seventeen days previously.

We will not be far out then, according to our present knowledge, if we put the incubation period of this disease as lying between six and twenty days, and that our most exact data give fifteen days as probably the commonest period.

One rather curious fact made out by Wright and others, is that the human blood has little or no power of killing off *M. melitensis* if introduced into it. If cholera or typhoid bacilli are injected under the skin in small quantities no infection takes place, as the blood has the power of killing them off. On the other hand the smallest quantity of *M. melitensis* gaining access to the blood stream gives rise to the disease. In this it resembles *B. pestis*, and gives some probability of Malta fever being spread in some way by insects.

Type of Fever set up in Man by the M. melitensis.—We have nothing to add to what has been written on this subject already, except to protest against the term "undulant" being applied to it. The so-called undulations are merely recrudescences or relapses of the fever, which may occur, and often do, in enteric and other fevers.

If anyone will take the trouble to look over a series of temperature charts, he will at once see that the term "undulant" is very misleading. Here and there will be found a chart where the relapses have taken place so regularly that a wave-like appear-

ance is present. Such an example is given on p. 275 "Hygiene and Diseases of Warm Climates," but on looking over a series of these charts the thing which strikes one most is their extreme irregularity. The term "Malta fever" is doubtless an unfortunate one, as most place names for diseases are, but until we learn to name all infectious disease after the parasite which causes them, we are afraid the term will stand. If a man is suffering from tropical malaria, the disease should be called Laverania malariæ, if from sleeping sickness, *Trypanosoma gambiense*, if from Malta fever, *M. melitensis*, and so on; but we trust that such a ridiculous term as "undulant fever" will never come into general use.

Neither need we touch on such questions as the duration of Malta fever, the rate of mortality, the months or seasons in which it occurs, as these questions are all fully discussed in easily accessible papers. But in regard to duration we may say that we have lately seen a case in London which had lasted more than three years, and may further quote a few sentences from Bassett Smith, which are rather suggestive. He says:—

"Taking fifty consecutive cases which were under treatment in Haslar Hospital, the average duration of the attack was four months; if we multiply this by the total of cases for the year, which was 354 for the Mediterranean, and 67 for the Channel fleet, or a total of 421 cases, we have no less than 1,684 months' sickness, or about 50,520 days due to this fever, which would mean a total loss to the country of many hundreds of pounds. There were also two deaths at Malta, and from Haslar alone six men were finally invalided as unfit for further service. When we consider what a large proportion of officers (about one-third) was affected, the serious drain that it makes on the fleet is more apparent, especially attacking so many of the junior ranks. . . ."

Does the M. melitensis spread from Individual to Individual by Personal Contact, or does it give rise to Place Infection?—This is an important question, and the evidence is contradictory. In 1893 we wrote: "Malta fever is never, as far as I know, transmitted directly from person to person. In the hospitals in Malta, although cases are to be found all the year round scattered through the various wards, there is no evidence that it has been communicated to any of the other patients in a single instance." We believe that this statement was true for the five years we were stationed in Malta, from 1884 to 1889. But look at the evidence given since then. Zammit writes: "We have now a number of cases which tend to prove *infection from patient to healthy*. Major O'Connell,

R.A.M.C., has told me of the case of a man in hospital for over two months with broken jaw; when convalescent he was placed close to a man with Mediterranean fever, and he picked up the disease in a very short time. Many similar cases are reported from other points." Read also what Bassett Smith writes: "Here again we see the overwhelming preponderance of cases from Malta, thirty-seven of which are definitely stated to have been contracted in the Royal Naval Hospital at that place, though I believe this is far short of the real number, for at one time it seemed that many cases on the surgical side, who were admitted for fractures, operation for hernia, &c., during their stay in hospital developed the fever, details of fourteen being distinctly given. One case was most interesting. C. S., Master-at-Arms, who had for four years been in charge of the canteen on shore, and two years previously on the station, without contracting the fever, was under treatment in hospital for fistula. Three days after returning to duty he developed Mediterranean fever, which has run a very severe course." . . . .

"In the sick berth staff there were no less than twenty-eight cases; out of these, twenty-two were men serving in the R.N. Hospital, Malta."

"It is an important etiological fact that so large a number, with one surgeon, who necessarily came much in contact with cases suffering from the fever in its *early stages*, should contract the disease, leading us to consider carefully the possibility of the direct contagiousness of the disease, either through insect transmission or through infection of the building."

What could be more contradictory? Our observations were made in the Station Hospital, Valetta, and of course we took the greatest care in diagnosis. There was a fever which occurred in summer, and one summer in great numbers, which attacked almost every patient in hospital, whatever his complaint. But this fever only lasted four to seven days, and although it was acute while it lasted, left no ill-effects. It was never properly diagnosed, but passed under the name of febricula or S.C. fever. Now, if any medical officer in the Valetta Station Hospital will compile a list of cases of true Malta fever which have occurred in patients admitted for other diseases, and not beginning until at least twenty days after admission, for the years 1890 to the present time, we shall be greatly obliged.

If this list contains many names we shall be greatly surprised. The list should give date of admission, disease, date of commencement of Malta fever, duration of fever, and any proof available that

the fever was really Malta fever, such as pains in joints, agglutination tests, &c. It can be made into a short paper and published in the JOURNAL.

Diagnosis of Malta fever.—We will not enter into the clinical diagnosis of this fever, but merely make a few observations on diagnosis, based on the *M. melitensis.* The surest method of diagnosis is the finding of the micrococcus in the blood or spleen, *intra vitam* or *post mortem.* This method *intra vitam* of course would only be used if something important depended on an exact diagnosis. For example, when we were lately in Uganda, a case of fever occurred in one of our staff. The fever was not Laverania malariæ, which is the common fever there, since none of these parasites could be found in the blood; the fever did not react to quinine, nor were the symptoms suggestive of this fever. It lasted some five weeks and acute non-specific orchitis was present. In this case we thought it might be Malta fever and made a splenic puncture during life in order to see if the *M. melitensis* was present. In this we failed, but in view of the importance of finding this disease in Central Africa we felt justified in making a splenic puncture. In cases then, of doubt, when an exact diagnosis is important, we would counsel the careful and repeated examination of the blood for the micrococcus, and if that failed the withdrawal of a small quantity of splenic pulp. Five or ten cubic centimetres of blood, drawn aseptically from a vein of the arm and placed in several flasks of broth; or after careful sterilisation of the skin, the introduction of a sterile needle, *secundum artem,* into the centre of the spleen, and the planting of the pulp on agar, should give most valuable information.

But if it is impossible to make a diagnosis in this way, there still remains a useful method: the agglutination of the micrococcus by its specific serum. We must confess we have never had the same confidence in this method of diagnosis as many profess to have. As one factor in the diagnosis of a disease it is valuable enough, but to trust to it alone is dangerous. It is a method which requires some experience to get good results. All sorts of pitfalls beset the path of the beginner. We have reports from many parts of India reporting the presence of the disease, the diagnosis depending on the serum reaction alone. Take one fallacy: Semple informs us that after the *M. melitensis* has been cultivated artificially for a length of time in India it will agglutinate with any blood. In all probability then the geographical distribution of Malta fever has been exaggerated by this trusting to agglutination as a sole means of

diagnosis. The personal factor comes in strongly—what is positive sedimentation to one observer is negative to another. Manson gives an instance in which he submitted the blood from a doubtful case to three expert bacteriologists. One pronounced the disease typhoid, a second declared it to be Malta fever, whilst a third repudiated the idea that the ailment was either typhoid or Malta fever. We need not discuss the various methods of performing the agglutination test, as these are given in every text-book, but we would insist on every examination of blood by this method being safeguarded by numerous control experiments. It must be borne in mind, for example, that the *Micrococcus melitensis* will show a positive sedimentation reaction with almost all specimens of blood in dilutions of 1 in 2. Further, that samples of blood taken from cases other than Malta fever will sometimes show some signs of agglutination at 1 in 10, though this is the exception; and that a complete sedimentation is never obtained at 1 in 20 except the blood is from a case of Malta fever. It must be remembered that these agglutins may persist in the blood for long periods. It is reported that about 50 per cent. of cases will still show the agglutination phenomenon two years after the illness in dilutions of 1 in 10, and one case is given, examined seven years after recovery, which gave a positive reaction in a dilution of 1 in 20. This source of fallacy must therefore be borne in mind. One quality about the serum from cases of Malta fever is that if it does agglutinate the micrococci it does this with no uncertain hand. The average dilution giving a complete reaction is given as 1 in 500, and cases have been reported up to 1 in 6,000. In regard to the time which elapses from the commencement of the fever to the appearance of the agglutins in the blood, this is usually put down as occurring on the fifth day.

In regard to the lowest dilution which may be accepted as a proof that we are dealing with Malta fever, this has been usually put down at 1 in 10 if the clumping is well-marked, and takes place at once or within half an hour.

Conclusions.—The foregoing sketch of *Micrococcus melitensis* and the fever it produces is very incomplete, but it will serve to show how much there is to do before we can claim to have a fairly complete knowledge of this micro-organism.

The information we want particularly may be put under three heads:—

(1) Under what conditions does the micrococcus exist outside the body? To aid in this work it is very essential to find some

medium by which the *Micrococcus melitensis* can be easily separated from other bacteria. Does it pass through a filter of any kind which excludes most of the others? How does it behave to chemicals, heat, drying, sunlight? How long does it retain vitality in drinking water, sewage, urine, in various foods, soils, dust? Can it be found in the air or dust of places where the fever has broken out, or in the water from bathing places.

(2) How does it gain access to the body? By the mouth, in water, or food. Through mucous membranes in the form of dust; conjunctival, nasal, buccal, pulmonary. Through the skin; scratches, wounds, biting insects.

(3) How does it leave the body? Expired air, sputum, sweat, urine, fæces.

It also seems to us that a careful study of this fever from the epidemiological side should throw some light on it if every case was fully investigated. The barracks carefully mapped; the exact spot where the cases occur charted; the habits of the men as to food, drink, bathing, sanitary surroundings, &c.

Echoes from the Past.

THE ARMY SURGEON AND THE CARE OF THE SICK AND WOUNDED IN BRITISH CAMPAIGNS DURING THE TUDOR AND EARLY STUART PERIODS.

By Capt. H. A. L. HOWELL.
Royal Army Medical Corps.

Part II.

During forty years, 1559 to 1599, the unsatisfactory condition of Army Surgeons, largely due to the low classes from which they were recruited, attracted frequent attention. It was at last decided to increase their necessary qualifications, and a code of rules was drawn up, by which it was directed that, "Surgeons should be men of sobriety; of good conscience, and skilful in *that* science; able to heal all sores and wounds, specially to take out a pellet of the same."

During the campaigns in Ireland, in Elizabeth's reign, the soldier suffered terrible privations. This was largely due to the bad food supplied. Elizabeth introduced the custom of supplying the army with rations in part payment of their wages. The country did not grow grain, and was largely covered with bogs and dense forests. The purveyors and contractors supplied food stuffs, chiefly biscuit, from England, and these were of such bad quality that, added to the dampness of the climate and the hardships incidental to active service, dysentery and fevers were very rife. Sir John Smythe, in a letter of this date, after referring to the bad food supplies, says, "diverse thousands of their souldiours, partly by hunger and partly by evil lodging, and altogether by the small care and misuse of our such men of warre, did perish. Besides that, great numbers of such their sick and starved soldiers, by order of the Earle of Leicester, were in those partes embarked and transported into Essex and Kent, and other partes of England, to recover health; of which foresaid great numbers of miserable and pitiful ghosts, or rather shadowes of men, the Essex and Kentish carts and carters (that carried them) can testifie; of which scarce the fortieth man escaped with life." We gather from the letters of Barnaby Googe, "a scholar, philosopher and poet," a poor gentleman who was driven to take service in Ireland, that

physicians were scarce in Ireland at this time. He describes how "comynge syck from sea, my lodgynge on the ground," "the sudayne change of my dyett and the barbarous relief I have had hath brought me the country disease (dysentery)." He says later, in a letter to Lord Burghley, from Drogheda, "I have, my Lord, thank God, recovered my health, having no other physytyon nor ffrende to looke to but hym," and ascribes his recovery to drinking water out of a "rusty skull." There was at this time only one apothecary in all Ireland, a Thomas Smyth, of Dublin, to whom, in 1566, was granted a *concordatum* to receive "the yearly sum of one day's pay of the Lord Deputy, and whole army in Ireland, and also 20 shillings of every sworn Councillor, in order to encourage the said Smyth to continue in the discharge of his ministry in Ireland." The English troops in Ireland occupied numerous garrisons. These garrisons had to be supplied by means of strong convoys. Their chief provisions were dried fish, salt beef, beer and wine. Outside the garrison towns there was little safety for an Englishman. Flying columns were the features of the plan of campaign. The Irish were a very mobile and active enemy, and, in many instances, columns had to retreat, fighting continuous rear-guard actions. In such cases the women, followers, and sick and wounded, with the transport, led the retreat, as, for instance, in Boyle's retreat from Ballyshannon when attacked by the O'Donnels.

The Army Surgeon took his part in the other campaigns of Elizabeth's reign. He accompanied the 15,000 men sent, at different times, under Lord Willoughby, Sir John Norris, and the Earl of Essex, to the aid of Henry IV. in France. He was with the English force, in 1589, which landed in Portugal, besieged the Groyne and burnt Vigo; as well as in 1596, "when the King of Spain's beard was singed," by the capture of Cadiz and the ravaging of the coast of Spain. We find the Army Surgeon of this period serving, not only on land but on the sea, as occasion required.

It was proposed to send an English army of 25,000 foot, 5,000 horse, and 20 pieces of artillery, to the Palatinate in 1620. The estimates for the expedition are given in Grose and Scott, quoted from the Harleian MSS., and from these we gather that it was intended to provide a liberal medical staff. It was proposed that there should be:—

"In the General's trayne, two physicians at 6s. 8d. *per diem* each; two apothecarys, at 3s. 4d.; and two surgeons, at 6s. 8d. each."

Every regiment of Infantry was to consist of twelve companies of

150 men each, and had a chief surgeon at 4s. a day, and one surgeon for each company at 1s. a day. One chief surgeon at 4s. a day was to be appointed among the Generals of horse, probably also to superintend the surgeons of troops. To every troop of horse, consisting of 100 men, was allotted a surgeon at 2s. 6d. a day; and to the ordnance and pioneers a "barber surgeon" at 2s. a day, and two "under barber surgeons" at 6d. a day each. It is evident from these lists that there were several grades of surgeons, each drawing a different rate of pay, in addition to the physicians and apothecaries. In the same year, 1620, a Surgeon Major to the camp was appointed with pay at the rate of 5s. a day, and two mates under him at 4s. a day each.

The forces which really went to the Palatinate in 1620 were commanded by Sir Horatio Vere, and only numbered 2,200. This force suffered great privations owing to the inclemency of the weather, and had, at one time, to burn their transport waggons for fuel. In 1624 Count Mansfield raised 12,000 foot and 200 horse in England for service in the Palatinate. These troops were hastily embarked in over-crowded ships, lost half their number by sickness, probably typhus, in a few weeks, and failed to be of any service. Both of these expeditions were accompanied by a medical staff. In 1625, 80 English ships and 10,000 soldiers made an abortive attack upon Cadiz. The expedition was badly equipped, there was a want of provisions, plague also broke out, and, after storming a fort at Cadiz, the force returned to England. The usual complement of Medical Officers accompanied the troops. In 1626, Charles I. determined to send aid to the Huguenots who were besieged in La Rochelle by Richelieu and a large French Army. He called upon the Corporation of Surgeons of London to provide surgeons for the expedition, and also to supervise the supply of medicines, &c., required. His instructions were conveyed in the form of an Order of the Lords of the King's Most Honourable Privy Council. Woodall, who was at this time the most prominent member of the Corporation of Surgeons, drew up a statement of the inducements offered by this Order in Council for the information of the young surgeons. We quote some extracts from his statement:

"I acquaint the younger sort of surgeons, my brethren, with these especial favours which it pleased our most gracious King Charles to bestow upon our Corporation in particular, for the good of his souldiers and seamen, and our encouragements, thereby to animate and inable us the more heartily to serve him. And namely:—

"First, His Highness was graciously pleased to augment each surgeon and surgeon's mate in H.M.'s service by sea and land to above a third penny from former custome, namely, from 19 shillings 4 pence a moneth to 30s. to surgeons, and 20s. to mates. And, nevertheless, all the surgeons in His Highnesse's service have, as formerly, by the head of all men that are in pay in any of his ships or land service two pence of each man by the moneth. And for the surgeons in his land service he alloweth to the surgeon-major of the whole camp 5s. a day; and for his two mates or servants 4s. a day. Also His Majestie allowed to each surgeon 2s. 6d. the day, which is £3 15s. the moneth, and to each mate £3 a moneth, and moreover alloweth and gave to each surgeon appointed to 250 men a surgery chest of £17 valew, free of account: and moreover His Majestie alloweth to the surgeon-major a store-chest or magazeen chest of £48 valew, for a supply to furnish upon all wants and occasions. And His Highness was yet further well pleased to give authority unto the Masters and Governors of our Society for to have the making, compounding, fitting and ordering of all the medicines, as well physicall as chirurgicall, together with all other provisions belonging unto the surgeons' chests." The Corporation of Surgeons were also empowered to press surgeons and surgeons' mates for the King's service, and could also "commandeer" any instruments or drugs which were required. The King rewarded the Corporation with a new Charter, which provided for the election of ten examiners to ascertain the fitness of all surgeons who desired admission to the Company. Surgeons' apprentices were at this time required to have a knowledge of Latin and to attend a lecture on surgery once a week.

We gather from the above-mentioned Order in Council that, in the early part of Charles I.'s reign, there were three distinct ranks of army surgeons, namely, surgeon-major, surgeon and surgeon's mate. The Crown had also undertaken to provide the necessary medical and surgical equipment. Prior to this, the surgeon had to provide these out of the 2d. a head which he received from each soldier on pay day as "regards." It appears from several references in writings of this period that the surgeons' mates were, not infrequently, apprentices of the surgeon.

In 1627 Buckingham and a force of English troops went to the aid of La Rochelle. He landed on the Isle de Ré, and was repulsed. Most of the soldiers and sailors and some of the surgeons had been raised by impressment.

In 1628 a second expedition was fitted out and was about to

leave Portsmouth when Buckingham was assassinated. La Rochelle soon afterwards fell.

King Charles' letter to the Company of Surgeons concerning this expedition is worth quoting:—"After our hearty congratulations, whereas there is present use for a convenient number of chirurgeons for the 4,000 land souldiers that are to be sent with His Majesty's fleet, now preparing for the relief of Rochelle; these shall be to will and require you, the Masters and Wardens of the Company of Chirurgeons forthwith to impress and take up, for the service aforesaid, sixteen able and efficient chirurgeons, and that you take special care that they be such in particular as are best experienced in the cure of wounds by gun-shot, and likewise that their chests be sufficiently furnished with all necessary provisions requisite for the said employment, and that you charge them upon their allegience, as they will answer to the contrary at their perils, to repair to Portsmouth by the 10th of July, to go along with such commanders in whose company they shall be appointed to serve. And you are further, by virtue hereof, to require and charge all mayors, sheriffs, justices of the peace, bailiffs, constables, headboroughs, and all other His Majesty's Officers and loving subjects, to be anxious and assisting with you in the full and due execution of this our letter, whereof neither you nor they may fail of your perils, and this shall be your warrant.—Dated at Whitehall, this last day of June, 1628."

Rushworth tells us that in Charles I.'s army for Scotland in 1639 there were "two chaplains at 6s. 8d. each, and two physicians at ditto." These were in the Lord General's train, which also included "two chirurgeons at 4s. each, and two apothecarys at 3s. 4d. each." There was one[1] surgeon at 4s. a day, provided for the train of artillery who was also allowed a servant at 1s. a day. In this army each regiment numbered 1,500 men. Each troop of cavalry consisted of a captain at 8s., a lieutenant at 5s., a cornet at 4s., three corporals at 2s., two trumpeters, one quartermaster, a chirurgeon, and eighty horsemen at 2s. 6d. a day each.

In a book—"The Art of Warre, by the Lord of Praissac; Englished by I. C., Cambridge, 1639"—appears under the head of "Barber Chirurgeon": "In everie companie there must be a chirurgeon, to trim the souldiers, to attend them which are sick, to dresse the wounds of such as are hurt (being as an assistant to the

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[1] Other authorities say there were five Artillery surgeons, only one being allowed a servant.

chirurgeon of the regiment), having proper remedies to stench the bloud, to hinder inflammation, and to asswage the pain." The company-surgeons were under the superintendence of the regimental surgeon.

No account of the Army Surgeon during the period under record would be complete without some reference to the three chief army surgeons of that time, namely, Clowes, Woodall and Lowe.

William Clowes served as a naval surgeon on board the "Aid," one of Queen Elizabeth's ships, in 1570. He afterwards settled in London and became surgeon to St. Bartholomew's and Christ's Hospitals. In 1586, he was sent for, by letters from the Earl of Leicester, General of the English troops in the Low Countries, to come and take upon him the care of the wounded men, by command of the Queen, together with William Godorus, her Sergeant Surgeon. This is all we know about his military and naval service. In 1679 he published the first original English work on syphilis. It was entitled "A Brief and Necessary Treatise Touching the Cure of the Disease now called Lues Venerea," and was dedicated to "the Society of Barbers and Chirurgions." He appears to have written an earlier work on the same subject, and another edition appeared in 1585. He calls the disease "the Morbus Gallicus or Morbus Neapolitanus, but more properly the Lues Venerea," or "in English, the French Pocks. A sickness, very lothsome, odious, troublesome, and daungerous, which spreadeth itself throughout all England and overfloweth, as I think, the whole world." "It is wonderful to consider how huge multitudes there be of such as be inflicted with it, and that dayly increase, to the great daunger of the commonwealth, and the stayne of the whole nation; the cause whereof I see none so great as the licentious and beastly disorder of a great number of rogues and vagabondes." He goes on to say that he, with three others, in five years had cured 1,000 and more persons of the disease in the Hospital of St. Bartholomew. "For it hapneth in the House of St. Bartholemew very seldom but that among every twentye diseased persons that are taken in, fifteene of them have the pocks." The disease was evidently of severe type for Clowes describes the skin of the sufferers as being covered with pustules or "whelks"—a probable reference to rupia. The disease showed constitutional symptoms from the onset. Clowes recommended the administration of mercury "by unction," as a specific for the disease. In 1591, appeared Clowes' book, "A Proved Practise for all Young Chirurgeons, concerning Burnings with Gunpowder, and Woundes made with Gunshot, sword, halbard,

pike, launce, or such other." In gunshot wounds he used mild emollients. In checking hæmorrhage after amputation he applied "buttons" of absorbent, styptic material to the bleeding vessels, sustaining them in position by means of tow and lint with strong pressure. Although acquainted with Parè's method of tying arteries he says he had never found it necessary to do so. In this book he also laments the number of unqualified and ignorant persons who found their way into the Navy and Army as surgeons, and says that, as a result, "truly many a brave souldier and mariner hath perished, and sometimes the generall and captaines themselves."

John Woodall served as an Army Surgeon in the English force which accompanied Lord Willoughby to France to the aid of Henry IV. He is also said to have travelled a good deal on the Continent, and to have made voyages to the East Indies. He became a member of the Surgeons' Company about 1612, and was elected surgeon to St. Bartholomew's. He then became Surgeon General to the recently formed East India Company, having medical charge of their dockyard at Blackwall and of all their medical arrangements. His name appears in the East India Court minutes, for the first time, in 1614. In 1626, we find him directing all the medical affairs of the Royal Navy. Woodall, therefore, enjoyed the unique honour of being a British Army Surgeon, and Director General of the medical affairs of the Royal Navy and of the East India Company; he was a member of all three of the medical services, English, Naval and Indian. In 1617, Woodall published his "Surgion's Mate," "chiefly for the benefit of young sea-surgions imployed in the East India Companie's affairs." This book is a practical manual dealing chiefly with fractures, dislocations, amputations and the like, but it also dealt with "the scurvie, the fluxes of the belly, of the collica and iliaca passio, tenasmus and exitus ani, the callenture." He tells us, "Scurvy is a disease of the spleen." "It is plain that this grief is a lazy, foul disease with obstructions of the liver, or spleen, or both; as also it appeareth that the head is much diseased, and that there is great obstructions in the brain, for that the eyes not only look evil coloured, but also the gums putrefy, and the teeth grow loose, and all the sinewy parts of the body bear their part in the disease for the shrinking and withering of the sinews, with the great pains the party hath, declareth no less." He recommended bleeding, and pills of gamboge or euphorbium, but told the young surgeon to be very careful to what extent he used these remedies, as excessive depletion "makes the disease worse." He also strongly recommended lime juice, and

was the first medical writer to do so, but he probably based his treatment on the experience of Captain (afterwards Sir) James Lancaster in 1601. Woodall's directions for taking lime juice in scurvy were, "each morning two or three spoonfuls, and fast after it two hours, and if you add one spoonful of aqua vitæ thereto, to a cold stomach, it is better." In 1628, he produced "Viaticum, or Pathway to the Surgeon's Chest." This contains descriptions of the instruments, utensils, and medicines of a surgeon's chest, and of their uses and qualities. He is said to have invented an improved trephine. He was in London during the plague epidemics of 1625 and 1636, and suffered twice from a mild form of the disease. In 1639 he published "A treatise faithfully and plainely declaring the way of preventing, preserving from, and curing that most fearfull and contagious disease called the Plague. With the Pestilential Feaver and other the fearful symptoms and accidents incident thereto." The Plague at this time, and previously, was known as "the Botch"—botch meaning a bubo. Woodall said that plague was due to celestial and terrestrial causes. It was a punishment of man for his sins, and of the terrestrial causes he gives a very long list, which includes practically every insanitary condition common to the dwelling houses and towns of his time, together with bad food and want of food.

Woodall's remarks on surgery show a great advance in knowledge. He followed Paré in his method of applying ligatures to arteries after operation. He says, "If the leg be taken off above the knee, there is the more danger, also there is great care to be had to the great vein and artery—namely, that thou take them up and pierce them throw and make strong ligature about them, which must speedily be done if thou canst do it." Woodall is said to have been the first surgeon to advocate amputation through a joint.

Peter Lowe was a Scottish surgeon who had served, in Elizabeth's reign, for two years as "chirurgeon-major" to the Spanish regiment in Paris, and had followed his master Henry IV. to the wars six years. He then settled in Glasgow, and, having complained of the number of ignorant persons and quacks in practice as surgeons, the King of Scotland gave him the privilege, under the Privy Seal, of examining all practitioners in surgery in the western part of his kingdom. This grant is said to have been the origin of the Glasgow Medical School, and of the Faculty of Surgeons and Physicians there. In 1596, he published "a Discourse on the whole art of Chirurgie." This book passed through four editions, the last being published in London in 1654. Lowe's method of amputation

was rough and ready. He chopped the limb off by means of a hatchet, and checked the ensuing hæmorrhage by the application of red-hot irons to the stump. He advocated the use of the thread compress in the treatment of hæmorrhage. Lowe also produced in 1596 an essay entitled "An easie, certaine and perfect method to cure and prevent the Spanish Sicknes," based upon his foreign experiences of syphilis.

Correspondence.

"THROMBOSIS OF THE INFERIOR VENA CAVA FOLLOWING ENTERIC FEVER: RECOVERY: WITH ESTABLISHMENT OF THE COLLATERAL CIRCULATION."

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—As the medical officer under whose charge the case reported by Civil Surg. J. Mackay Huey, M.B., in the May number of the JOURNAL was, during its early stages, perhaps I may be permitted to supply a few additional particulars.

Lieut. M., a fortnight before the symptoms of enteric fever appeared, had been treated for a severe attack of quinsy, with high fever. The symptoms which caused anxiety during the attack of enteric fever were due to broncho-pneumonia, attended with dyspnœa and enfeeblement of the heart's action: he was also very restless and nervous, and the possible onset of intestinal hæmorrhage was feared, though it did not occur. The swelling of the legs appeared, to the best of my recollection, about the end of April. The pain accompanying the swelling was greater than usually noticed in such cases; swelling was noticed not only in the legs and thighs, but also in the iliac fossæ. The symptoms, however, were not so severe as one would have expected from the gravity of the complication, and the question of amputation never came under consideration.

I regret that as I have no notes to refer to, I am unable to give fuller information regarding the early stage of this interesting case.

J. G. McNAUGHT,
Captain R.A.M.C.

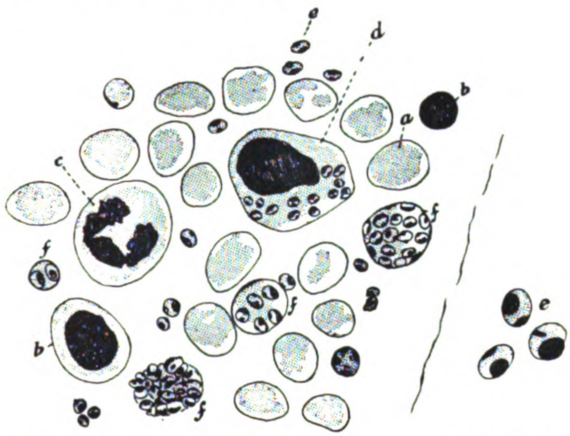
Edinburgh,
May 4, 1904.

Current Literature.

A Short Note on the Parasite of Kala-Azar.—By Charles A. Bentley, M.D., *Medical Officer, Empire of India and Ceylon Tea Co., Tezpur, Assam.* (Abstract—*The Indian Medical Gazette*, March, 1904.)

In the accompanying drawing I have endeavoured to give a fair idea of the appearance of the parasitic bodies which I have found in the spleen of all cases of *kala-azar* that I have been able to examine during the last few months.

a.—Red blood corpuscles.
b.—Large lymphocytes.
b.—Small ,,
c.—Polynuclear leucocytes.
d.—Large mononuclear leucocyte containing parasite.
e.—Free parasites.
f.—Bodies containing parasite.



Splenic blood film from kala-azar showing parasitic bodies, magnified about 1,200 diameters.

Free parasites magnified about 2,500 diameters.

In March, 1903, I found small amœboid bodies in the fresh spleen-juice of *kala-azar*, and subsequently in smears obtained *post mortem* and stained, I found numerous small bodies which I now recognise as the same parasites as those described in this article.

Improved technic, and the use of films prepared from splenic blood, drawn *intra vitam*, shows these bodies most distinctly to be parasitic organisms.

Last year an unexpected increase in my ordinary duties prevented me from pushing my investigations further, but recently, stimulated by the communications of Majors Leishman, Donovan and Ross, I have made a number of preparations, which show what I believe to be the parasite causing *kala-azar*, and which appears to prove that the chronic fevers with enlarged spleen and liver, the so-called "malarial cachexia" of Bengal and Madras, are identical with the famous *kala-azar* of Assam.

In May of last year Major Leishman described the bodies found by

him as far back as 1900 in cases of Dum-Dum fever, and more recently Major Donovan has shown that similar parasites are to be demonstrated in blood drawn from the spleen of "chronic malarial (?)" cases in Madras. The finding of similar organisms in cases of *kala-azar* adds still more to the interest and importance of the discovery.

The parasite may be found either in spleen smears, obtained *post mortem*, or in films prepared from blood, drawn from the spleen during life by means of a sterilised hypodermic syringe. I have obtained the best results by staining specimens with Grubler's modified Romanowsky's stain. This stain, which is of the single-fluid type, is a solution in absolute alcohol, and the application of a drop of it serves to fix the specimen. The subsequent addition of a drop of ordinary water, and its admixture with the still liquid stain upon the film, causes a reaction, during which differential staining takes place. If the slides are washed after waiting for a minute or so most beautiful specimens can be obtained, without the slightest precipitation of stain upon the films.

Stained in this way the parasite may be easily distinguished as a clearly defined oval body of a bluish mauve, containing a larger oval and smaller rod-shaped mass of deeply crimson-stained chromatin. The smaller chromatin body stains the more deeply.

The parasite occurs free among the spleen cells, singly or in groups, but it may also be found in distinctly defined round cells, varying in size between about 5 m.mm. to 10 or 12 m.mm. These cells stain a pale mauve colour, and contain from two to a dozen parasites. Many parasites may also be observed lying within the protoplasm of the large mononuclear and transitional leucocytes. Frequently large masses may be noted, composed of several hundred of the free parasites, but these should not be confused with collections of blood plates, which may often be observed in the same specimen.

Roughly speaking, the parasite may be said to measure 2 to 3 m.mm. in the long axis, and 1½ to 2 m.mm. in breadth. The size, however, appears to vary with the thickness of the film. In thin films the bodies appear almost round, while in thicker films they assume an oval or even a fusiform shape.

So far, I cannot say that I have recognised many intracorpuscular forms, unless the round cells mentioned above are altered blood cells. I have, however, sometimes found isolated endocorpuscular bodies in blood films from the peripheral circulation, and I have frequently observed what I believe may have been free forms. Their recognition is very difficult and uncertain however, and examination of the peripheral blood cannot be relied upon for purposes of diagnosis.

Laveran has already pronounced these bodies to be a species of pyrosoma, but the correctness of this statement has yet to be demonstrated.

Should Laveran's theory prove correct, the spread of *kala-azar* and kindred diseases will probably be found to be due to the bite of some blood-sucking insect, such as a species of tick, or perhaps lice, fleas, or bugs.

There is also the possibility of the disease having been originally conveyed from cattle to man through the instrumentality of cattle ticks, for it is well known that in many parts of India the people are accustomed to stable their cattle beneath the same roof, or adjacent to their own houses, and enquiry will often elicitate the statement that people who

live thus in close proximity to their domestic animals are frequently attacked by the ticks which fall from these beasts.

It will be seen at once that the discovery recorded in this article disposes once and for all of the Malta fever theory of the causation of *kala-azar*, although it does not necessarily negative the occurrence of this former disease in Assam.

It is hardly necessary to refer to the malarial theory of the etiology of *kala-azar*, because this has been abandoned as no longer tenable by all competent authorities.

I may, however, record the fact that the examination of considerably over 1,200 blood films from cases of this disease has resulted in the finding of malarial parasites in less than fifty.

Among those showing malarial parasites, quartan, benign tertian and malignant tertian in single and mixed infections, have been recorded in about equal proportions.

In spleen smears no malarial parasites have been seen, but old malarial pigment occurred in about half the specimens examined.

In regard to the suggestion that was thrown out at the last British Medical Association Annual Meeting, hinting at a species of trypanosome as the cause of *kala-azar*, I may state that little direct evidence can be brought forward in support of this idea. So far, although I have examined 4,000 or 5,000 blood films from all kinds of fever cases, during the past five years, I have never found any trace of a trypanosome in human blood, neither have I been able to discover trypanosomes in the blood of any species of mammal in this part of India. I have, however, frequently found trypanosomes present in the blood of two species of mud-fish, which live in the bheels of this part of Assam.

The examination of several hundreds of these fish brought to light a strange fact, which has a special interest after the suggestion which has been made as to the possibility of *kala-azar* being trypanosomiasis.

It appears that mud-fish taken from marshy places adjacent to coolie lines in a great number of cases harbour trypanosomes. The fish taken from bheels adjacent to a large set of lines in which *kala-azar* had broken out, in nearly every instance were the hosts of this parasite.

Thirty odd fish of this particular species, taken from a bheel adjoining a village which had been attacked by *kala-azar*, showed 100 per cent. with trypanosomes. Fish of this kind from other parts of the district, or from other parts of Assam (Gauhati), were entirely free from this parasitic invasion.

What the explanation of this fact may be I cannot suggest, but the existence of diseased fish apparently only in water subject to fæcal contamination, and the occurrence of this disease specially among fish in bheels adjacent to *kala-azar* infected villages and lines, is a fact which appears to merit further investigation.

New Mosquito Disease.—According to Dr. Graham, of Beirut, another disease is to be set down against the mosquito, namely dengue fever, variously called African fever, break-bone fever, giraffe fever, dandy fever, &c. The disease is an acute eruptive fever, rarely fatal, but leaving various disagreeable sequels—paralysis, insomnia, marked mental and physical prostration, &c. It occurs in hot climates and in the Southern States; during the last fifty years several serious epidemics have occurred.

Dr. Graham found that he could regularly produce an attack of dengue in a non immune by submitting the latter to the attack of mosquitoes which had fed on sufferers from the disease. In one experiment he carried dengue-infected mosquitoes to a mountain town 3,000 feet in altitude, where there were no mosquitoes and no dengue. One of the natives was shut up in the room with the mosquitoes, and on the fourth day came down with a sharp attack of dengue, and a second presented the typical symptoms on the fifth day. The mosquitoes were immediately destroyed, and no further cases occurred. Dr. Graham also claims to have discovered the germ which causes dengue in both human blood and the stomach of the mosquito. It resembles some forms of the malarial parasite.—*American Medicine.*

Trypanosomiasis.—In a report of experiments with the genus of protozoa, *Trypanosoma*, Dr. P. Ehrlich, of Frankfort-a.-Main, said that he had produced a compound which possessed a decided specific action upon the *Trypanosoma equinum* (the protozoon of mal de caderas). Mice infected with this parasite were rendered temporarily immune by this substance which he has named "Trypanroth." Further experimentation he hoped would discover a compound which would cause a reaction on the part of the organisms of other animals sufficient to kill the parasite. Professor Ehrlich compared the action of the various substances (arsenic and benzopurpurin) which had been found to produce what had proved a temporary immunity to the trypanosoma to the action of quinine in malarial infection.—*Medical News.*

The Report on Filters by the French Academy of Medicine.—In *Le Caducée* for December 19, 1903, the Editor, Dr. Grandjux, discusses this report and makes various suggestions. He refers to the discordant views entertained when filters were first adopted in military establishments. On the one hand, it was affirmed that typhoid fever ought at once to disappear; on the other, it was pointed that the use of filters would not affect the other channels of communication, and that it was useless to expect results which filters could not achieve.

When the reform had been accomplished, and there was no suspected water in any barracks, the cases of typhoid were reduced by 50 per cent.; and this proportion has since been maintained. The diminution represents the part played by water as a vehicle.

The notion, once entertained, that Eberth's bacillus could be conveyed by one channel, and by no other, is no longer tenable. But rather than relinquish it, the legend was invented of the soldier who went to the public-house for his drinking water. According to another theory, the filters failed to do their duty; and this solution found favour with the French Minister for War, as shown by a letter addressed to the Academy. He asks "when it seems likely that suspected water will be supplied to the barracks; would it not be better to adopt the plan of sterilisation by heat, instead of filters, the action of which has appeared to be rather illusory, and even dangerous, because of the false security which it gives, as proved by recent experience?"

A committee was thereupon constituted; the following are the principal paragraphs in their report:—

The two systems, filtration and heat, present advantages and drawbacks;

much depends upon those in charge of the delicate and complicated apparatus, and the superintendence.

During fifteen years, a large number of filters have been used in barracks and hospitals; they have proved to be wonderfully serviceable. But they require minute attention; and every fortnight taking to pieces, cleaning, inspection, replacement of perhaps 150 fragile tubes and receptacles. In default of such attention, the filters rapidly become useless, or even dangerous.

Sterilisation by heat is a recent invention. The apparatus employed has already produced excellent results, and is very favourably regarded. Pathogenic germs are absolutely destroyed, and the sterilising power is not subject to such limitations as that of filters, which are liable to become dirty and obstructed, as well as to cracks and breakage. The action of the sterilisers is continuous, night and day, and requires very little supervision; only a few are needful, and they can be satisfactorily cleaned, every two or three months in a few hours by an armourer's assistant. A longer experience may perhaps reveal certain inconveniences and disadvantages, but while retaining filters a larger number of sterilisers should be employed, and a final judgment should be deferred until some years have elapsed.

Whatever system may be adopted, it is highly important that both sterilised and filtered supplies should possess that pleasant freshness which is characteristic of spring water, whereby thirst is more effectually quenched. Moreover, cold suspends or retards the multiplication of organisms accidently present in the reservoirs; and cold water of doubtful quality, or even contaminated, is always preferred to a really pure sample made lukewarm by manipulation.

The proper place for reservoirs of filtered or of sterilised water is below ground, whence it can be raised and distributed by the aid of a pump or the public water pressure. The reservoirs should be capable of being emptied to the bottom and sterilised twice a year.

The following conclusions were unanimously adopted by the Academy:—

(1) The best plan of preventing the conveyance of typhoid by water is to supply all garrisons with water from a pure source and of good quality, pleasant to the taste, carefully protected and inspected, so that all risk even of temporary contamination may be avoided.

(2) When these conditions can be fulfilled, it is useless to have recourse to any method of sterilisation, except as a temporary arrangement, when some accident has occurred.

(3) Without abandoning filters, which do good service when kept in thorough order and carefully inspected, it would be well to employ additional sterilisers (by heat) as an experiment, whilst taking the greatest care to restore and preserve all the freshness of the sterilised water.

In conclusion, Dr. Grandjux alludes to the difficulty of keeping the filters in good order, due to the incompetence of those employed in such work. There is no good reason why the regimental medical officer should be charged with the care of filters; he has no authority outside the hospital, and his subordinates, chosen at hazard, are changed from day to day. The duty ought to be entrusted to the company which supplies and sets up the filters. Such an arrangement might result in the lessening of expense, for the company's charges would scarcely exceed the cost of breakages by the unskilled hands at present employed.

Corps News.

NOTICE.

In future the Corps News will be printed as an insert to the Journal, and separate copies may be subscribed for, price 2d. monthly.

Royal Army Medical Corps.

Capt. G. Dansey-Browning is seconded for service with the Egyptian Army, dated March 31, 1904.

The undermentioned Lieutenants, from the Seconded List, to be Lieutenants, dated April 5, 1904:—

R. M. Ranking, M.B., F. H. Noke, M.B.

Lieut. G. W. G. Hughes is seconded for service with the Egyptian Army, dated April 7, 1904.

Lieut. G. W. Smith, M.B., resigns his Commission, dated April 23, 1904.

Lieut.-Col. W. W. Kenny, M.B., to be Colonel, on augmentation, dated April 1, 1904.

Lieut.-Col. W. L. Lane, M.B., retires on retired pay, dated May 11, 1904. He entered the Service, August 4, 1878, was promoted Surg.-Major, August 4, 1890; and Lieutenant-Colonel, August 4, 1898. He served in the South African War, 1902. Operations in Orange River Colony, April to May 31, 1902.

The undermentioned Lieutenants to be Captains:—

M. F. Foulds, dated April 9, 1904; J. B. Clarke, M.B., dated April 14, 1904; D. L. Harding, dated April 26, 1904.

Col. (temporary Surg.-Gen.) W. F. Stevenson, M.B., C.B., is continued on the Active List as a Supernumerary to the Establishment, under the provisions of Article 473, Royal Warrant, October 26, 1900.

Guards.

2nd Life Guards.—Surg.-Lieut. R. M. Cowie to be Surg.-Capt., dated April 11, 1904.

Royal Horse Guards.—Capt. St. J. B. Killery, from the Royal Army Medical Corps, to be Surg.-Capt., dated May 4, 1904.

Scots Guards.—Surg.-Lieut.-Col. G. S. Robinson retires on retired pay, dated May 7, 1904.

Army Medical Reserve of Officers.

Surg.-Capt. W. Curtis, 1st Volunteer Battalion, Prince of Wales's Volunteers (South Lancashire Regiment), to be Surg.-Capt., dated April 16, 1904.

Surg.-Capt. D. Todd to be Surg.-Major, dated April 13, 1904.

Surg.-Lieut. G. F. Whyte, M.B., to be Surg.-Capt., dated April 17, 1904.

Surg.-Capt. H. D. Brook to be Surgeon-Major, dated April 23, 1904.

Surg.-Lieut. A. A. MacKeith to be Surgeon-Captain, dated April 28, 1904.

Royal Army Medical Corps (Militia).

Lieut. R. le G. Worsley resigns his Commission, dated April 16, 1904.

2nd South-Eastern District Company.—Lieut. H. V. Craster resigns his Commission, dated April 23, 1904.

Imperial Yeomanry.

Derbyshire.—Surg.-Lieut. R. M. Wilson, M.D., to be Surg.-Capt., dated April 23, 1904.

The North of Ireland.—Edward Charles Thompson, M.B., to be Surg.-Major, dated April 16, 1904.

Denbighshire (Hussars).—Surg.-Capt. R. Williams resigns his Commission, dated May 7, 1904.

Fifeshire and Forfarshire.—Surg.-Capt. T. F. Dewar, M.B., to be Surg.-Major, dated May 14, 1904.

Royal Army Medical Corps Volunteers.

The London Companies.—Surg.-Major V. Matthews to be Surg.-Lieut.-Colonel, and to Command, under Paragraph 55A, Volunteer Regulations, dated April 9, 1904.

The London Companies.—The following is substituted for that which appeared in the *London Gazette* of the 15th instant:—Major V. Matthews to be Lieut.-Colonel, and to Command, under Paragraph 55A, Volunteer Regulations, dated April 9, 1904.

1st *Lothian Bearer Company.*—Lieut. A. A. Ross, M.B., to be Capt., dated April 30, 1904.

The Leeds Company.—William McGregor Young, M.A., to be Lieut., dated May 7, 1904.

The Maidstone Companies.—Bernard Dalby Hobson, Gent., to be Quartermaster, dated May 7, 1904.

The Manchester Companies.—Capt. J. B. Mann to be Major, dated May 7, 1904.

Quartermaster G. R. Wattleworth to be Transport Officer, dated May 7, 1904.

The Woolwich Companies.—Quartermaster J. H. Naylor to be Transport Officer, dated March 31, 1904.

The Manchester Companies.—Sidney Pritchard, Gent., to be Quartermaster, dated May 14, 1904.

The Woolwich Companies.—The resignation of Lieut. E. B. Dowsett, which appeared in the *London Gazette*, of March 18, 1904, is cancelled.

2nd *London Bearer Company.*—Lieut. E. C. Montgomery-Smith to be Capt., dated May 14, 1904.

Bearer Company Royal Army Medical Corps (Volunteers).

Sussex and Kent.—James Augustus Rooth, Gent., to be Lieut., dated May 7, 1904.

Volunteer Corps.

2nd *Devonshire Royal Garrison Artillery.*—Surg.-Major A. K. Crossfield to be Surg.-Lieut.-Colonel, dated April 9, 1904.

1st *City of London Royal Garrison Artillery.*—Paul Joseph O'Sullivan, Gent., to be Surg.-Lieut., dated April 9, 1904.

3rd *Volunteer Battalion the Welsh Regiment.*—Lieut. I. G. Thomas resigns his Commission, and is appointed Surg.-Lieut., dated April 9, 1904.

1st *Sussex, Royal Engineers.*—Surg.-Lieut. E. S. Cardell resigns his Commission, dated April 16, 1904.

1st *Volunteer Battalion the Durham Light Infantry.*—Surg.-Lieut. L. J. Blandford, M.B., to be Surg.-Capt., dated April 16, 1904.

1st *Bucks.*—Brig.-Surg.-Lieut.-Colonel W. H. Bull is seconded, whilst holding the appointment of Senior Medical Officer of the Home Counties' Volunteer Infantry Brigade, dated April 23, 1904.

John Charles Baker, Gent., to be Surg.-Lieut., dated April 23, 1904.

2nd *Volunteer Battalion the Loyal North Lancashire Regiment.*—The undermentioned gentlemen to be Surg.-Lieuts.:—

James Wood, dated April 23, 1904.

Frank Robinson, dated April 23, 1904.

16th *Middlesex (London Irish).*—Surg.-Lieut. C. R. Keyser to be Surg.-Capt., dated April 23, 1904.

1st *Banff Royal Garrison Artillery.*—Surg.-Major (Surg.-Lieut.-Colonel, Army Medical Reserve of Officers) W. L. Stewart, M.D., resigns his Commission, with permission to retain his rank and to wear the prescribed uniform, dated April 30, 1904.

John Hector Stephen, Gent., to be Surg.-Lieut., dated April 30, 1904.

1st *Devonshire R.G.A.*—Surg.-Capt. G. P. Barton resigns his Commission, dated April 30, 1904.

1st *Cinque Ports R.G.A.*—Surg.-Lieut. W. L. Chubb resigns his Commission, and is granted the honorary rank of Surg.-Capt., with permission to wear the prescribed uniform, dated April 30, 1904.

1st *Durham Royal Garrison Artillery.*—Surg.-Capt. D. Todd to be Surg.-Major, dated April 30, 1904.

1st Aberdeenshire Royal Engineers.—Surg.-Capt. W. Sinclair, M.B., to be Surg.-Major, dated April 30, 1904.

The Cambridge University.—Surg.-Capt. J. Griffiths, M.D., to be Surg.-Major, dated April 30, 1904.

3rd Volunteer Battalion the Welsh Regiment.—David Hepburn, M.D., late Major Edinburgh Company, Royal Army Medical Corps (Volunteers), to be Surg.-Major, dated April 30, 1904.

1st West Riding of Yorkshire Royal Garrison Artillery.—Surg.-Lieut. P. J. S. Bird, M.D., to be Surg.-Capt., dated May 7, 1904.

6th Volunteer Battalion the King's (Liverpool Regiment).—Honorary Lieut. in the Army, Michael Joseph Mahoney, M.B., late Capt., to be Surg.-Lieut., dated May 7, 1904.

1st (City of Dundee) Volunteer Battalion the Black Watch (Royal Highlanders).—Surg.-Lieut. G. F. Whyte, M.B., to be Surg.-Capt., dated May 7, 1904.

2nd Durham (Seaham).—Surg.-Lieut. J. P. French resigns his Commission, dated May 14, 1904.

4th Volunteer Battalion the Royal Fusiliers (City of London Regiment).—Brig.-Surg.-Lieut.-Colonel W. D. Waterhouse is borne as Supernumerary whilst holding the appointment of Senior Medical Officer of the 2nd London Volunteer Infantry Brigade, dated May 14, 1904.

2nd Volunteer Battalion the Prince Albert's (Somersetshire Light Infantry).—Surg.-Lieut. J. G. Bain, M.B., to be Surg.-Capt., dated May 14, 1904.

5th (Perthshire Highland) Volunteer Battalion the Black Watch (Royal Highlanders).—Surg.-Lieut.-Col. J. Mackay, M.B., resigns his Commission, and is granted the honorary rank of Surg.-Col., with permission to wear the prescribed uniform, dated May 14, 1904.

ARRIVALS HOME.—From Bermuda: Major H. C. Thurston, C.M.G. From West Africa, Major A. A. Sutton, D.S.O.

ARRIVALS HOME ON LEAVE.—Surg.-Gen. Sir T. J. Gallwey, K.C.M.G., C.B.; Lieuts.-Cols. F. J. Lambkin and D. Semple, Majors T. H. F. Clarkson, F. J. Wade Brown, G. B. Stanistreet and E. Mck. Williams, Capts. H. A. Bransbury, T. White, J. Tobin and W. L. Bennett.

EMBARKATIONS.—South Africa: Lieut. J. E. H. Gatt. Canada: Major A. Wright, by exchange.

POSTINGS.—Warley: Lieut.-Col. J. Carmichael. Salisbury Plain: Capt. and Bt.-Major A. F. Tyrrell. Manchester: Lieut.-Col. J. T. Carey.

SERVICE ABROAD.—The undermentioned Officers have been placed under orders for Service at the Stations named:—

Lieut.-Col. W. Dugdale, S. Africa.
Lieut.-Col. W. W. Pike, D.S.O., S. Africa.
Capt. H. W. H. O'Reilly, S. Africa.
Capt. N. Addams Williams, S. Africa.
Lieut.-Col. J. H. A. Rhodes, Malta.
Major J. M. Nicolls, Malta.
Capt. H. S. Taylor, W. Africa.
Lieut.-Col. B. W. Somerville Large, Jamaica.
Col. G. A. Hughes, D.S.O., India.

CHANGES OF STATION.—Capt. J. R, McMunn, Curragh to Dublin; Capt. T. McDermott, Dublin to Curragh; Major N. Manders, Devonport to Salisbury Plain; Lieuts. J. E. Skey and B. G. Patch, Woolwich to Salisbury Plain; Lieuts. C. R. Bradley and H. H. J. Fawcett, Netley to Salisbury Plain; Major A. L. Borradaile, Bodmin to Brecon; Lieut.-Col. W. Heffernan, Limerick to Fermoy; Lieut.-Col. L. W. Swabey, Fermoy to Limerick; Lieut.-Col. J. B. Emerson, Portsmouth to York; Lieut.-Col. C. R. Woods, Cork to Dublin; Capt. O. Challis, Aldershot to Colchester.

The undermentioned retired officers have been posted to the Stations named:—
Lieut.-Col. J. E. Nicholson to Fleetwood.
Lieut.-Col. W. L. Lane to Hamilton.

Lieut.-Col. G. S. Robinson to Eastbourne.
Lieut.-Col. J. McGann to Dublin Military Prison.
Major E. H. Myles to Guernsey.

Col. W. W. Kenny has been appointed Principal Medical Officer of the Transvaal District; Lieut.-Col. J. G. MacNeece, Principal Medical Officer of the Dublin District Staff; and Lieut.-Col. W. Keays, Principal Medical Officer of the 3rd Division 1st Army Corps.

Lieut.-Col. J. R. Dodd has been selected for increased pay.

Major A. Wright has been permitted to exchange with Major J. R. Mallins.

At the recent examinations at the R.A.M. College, Capt. R. F. E. Austin passed in Otology; Capt. G. A. Moore qualified as a Specialist in Laryngology; Major R. J. C. Cottell qualified as a Specialist in Midwifery and Gynæcology, and Capt. G. S. Mansfield passed in the same subject.

CASUALTIES, &c., R.A.M. Corps, from April 11, to May 10, inclusive:—

Discharge.—"Purchase": Pte. A. G. Nathan.

To Army Reserve.—Ptes. F. W. Fidler, F. L. Dodd, R. Philip, J. McCarthy, R. Forsythe, W. Groom.

Tranfers to other Corps.—2nd Cl. St.-Sergt. A. Hatt to Essex V.I.B.B. Coy.; 2nd Cl. St.-Sergt. J. Leonard to Lanc. Fus. V.I.B.B. Coy.; Lce.-Sergt. G. Bennett to Dub. Dist. Coy. R.A.M.C. Militia; 2nd Cl. St.-Sergt. J. A. Brown to Tyne Brig. B. Coy.; Bugler J. Cameron to Ranks.

Deaths.—Pte. S. Orgar, at Colchester; Corpl. E. B. Fouraker, at Netley; Pte. F. A. McEvoy, at Cairo.

Disembarkations.—From Gibraltar *ex* P. and O. "Britannia," April 18: Ptes. A. Abbott, E. T. Allard, H. Clarke, G. E. Fowles, S. H. Hall, F. Harrison, R. Lee, H. Page, J. H. Telford, W. A. White, P. Wood, A. G. Turpin. From Wei-hai-Wei *ex* P. and O. "Borneo," May 2: Sergt. E. Potter, Ptes. E. Evans, W. Matchin, W. Stiles. From Malta *ex* ss. "Rameses," May 3: Sergt. A. C. Upton, Ptes. W. Cox, S. Hacking.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE:—

Appointments: To be Staff-Nurse, Miss A. M. Pagan, posted to Royal Herbert Hospital, Woolwich.

Resignations: Sister Miss C. P. Gash has resigned her appointment, May 11, 1904.

Changes of Station:—

Sisters: Miss M. G. Hill, R.R.C., Mooi River, Natal, to Pretoria; Miss L. M. Todd, Pretoria to Mooi River, Natal; Miss S. L. Wilshaw, R.R.C., Devonport to Egypt.

GLASGOW COMPANIES, R.A.M.C. (Vols.)—The indoor training of the Companies is at present in full swing. A new feature this season being a course of lectures on Sick Nursing. The hospital beds with ward equipment complete have been supplied with a view to making these lectures as practical and instructive as possible, and judging from the large attendance these lectures seem very popular.

Capt. D. Christie, on transfer from the A. and S. H's I.V.B. Bearer Company, has been posted to A (University) Company.

Staff-Sergt. Lattemore has joined the permanent staff of the Division in succession to Staff-Sergt. Furness, transferred to the Bedford I.V.B. Bearer Company.

NOTES FROM ALDERSHOT.—A pair of very handsome tympani have been generously presented to the Band by Lieut.-Col. J. I. Routh. This good example is likely to be followed by others, several officers in the Station having already promised certain instruments likely to increase the efficiency of the Band. Lieut.-Col. G. W. Robinson, O. C. Depôt, has presented a silver cup to be held by the Depôt Company which has kept its kits and barrack rooms in the highest degree of excellence during each year.

The Depôt entered a team to compete at the Cookery Exhibition in London, and were successful in winning the Challenge Shield, which is open to competition throughout the Army and Auxiliary Forces. The names of the successful team are: 5738 Sergt. T. H. V. Coad, 2443 Pte. J. Papworth, 9338 Pte. W. Tubb, 12362

Pte. C. H. Porter. Also awarded silver medals: 9503 Pte. A. Winter, 9211 Pte. D. W. Ferguson, 7866 Pte. R. H. Miller.

Lieut.-Col. Pike, D.S.O., vacates the appointment of M.O. in the Military Families' Hospital, Aldershot, and proceeds to South Africa in June; he is succeeded by Major S. Powell.

The Aldershot Military Medical Society held their last meeting for the winter season in April at the Library, Cambridge Hospital, Aldershot, Surg.-Gen. MacNamara in the Chair; a large number of senior and junior officers were present. Papers were read by Lieut.-Col. Jenken and Major J. S. Edge on Minor Sanitation in Barracks, and on Judging Provisions, respectively.

NOTES FROM MALTA.—Major W. L. Gray, R.A.M.C., writes: "Since my arrival here I have been very largely employed dealing with sanitary questions, and also in collecting as much information on the subject of Mediterranean fever as I could gather from those having a larger experience than myself, with a view to obtaining hints as to a line of investigation.

"During the last hot weather, Mediterranean fever was very prevalent among the 60th Rifles, occupying the Floriana Barracks, and also among the married families at St. Francis Xavier. At both these places building operations were in progress, and also at other places where the disease was specially prevalent. I found that a 'general impression' prevailed, that recently turned up soil and building operations were conducive to the production of the disease."

NOTES FROM PRETORIA.—Lieut.-Col. Birt writes: "The Pretoria Medical Society, under the Presidency of Dr. Kay, has made the Officers of the R.A.M.C., serving in Pretoria, Honorary Members. On April 8 the Committee of the Society was entertained at dinner by the R.A.M.C. Mess. Surg.-Gen. Dallas-Edge, C.B., had also been asked to meet them. A Meeting took place in the Recreation room of the Military Hospital. Dr. Kay was in the Chair. Lieut.-Col. R. Porter read a paper on 'Enteric fever in Pretoria,' of which the following is a summary:—

"(1) Enteric fever is endemic in Pretoria, affecting all classes of the population, and is of frequent occurrence amongst the natives, assuming epidemic proportions, during the season beginning October and ending March.

"(2) The incidence of enteric fever was greater in units living in insanitary areas as compared with those located in more salubrious camps.

"(3) Causation of the epidemic was due to several factors, viz., water, pollution of soil, aërial contamination by means of dust and flies; the water supply was, however, the main channel of infection.

"(4) There is strong evidence pointing to a connection between the commencement of the rainy season, and the increased prevalence of enteric fever.

"(5) The Pretoria and Cantonment water supplies are subject to pollution in the collecting area; as the area is probably a very large one, and as it extends over the dolomite series, in which large fissures and caverns abound, the danger of water contamination will be always present.

"In discussing the type of the disease Col. Porter divided it into three classes: (1) *Typical*, (2) *relapsing*, and (3) *abortive*; as shown by temperature charts. Passing over the first two, he showed that many of the third class of cases, *i.e.*, the abortive type, were probably not true enterica, but belonged to the intermediate group, between the enteric and colon bacillus, termed the para-typhoid or para-colon.

"Col. Porter urged the adoption of direct bacteriological examination of the blood for diagnostic purposes, and described the technique to be employed. He went into the work done by Firth and Horrocks at Netley, with reference to the dust theory of the disease, which is so important in this country, and the necessity of taking preventive measures.

"He wound up his lecture by examining the causes of death, as taken from the *Post-mortem* book of the hospital, and made a few remarks on one very interesting case, from a pathological point of view, viz., a case of Thrombosis of the pia mater with softening of the ascending parietal convolution, in what used to be described as the arm area, without paralysis.

"During the lecture Widal's test was demonstrated by means of the microscope and the sedimentation process; cultures were also shown taken from Pretoria

water supply, soda water manufactured locally, and a pure culture of the enteric bacillus taken from the spleen of a patient who had died of enteric fever.

"In the discussion which followed, some of the civil practitioners who took part in it were inclined to think there was, in many of the cases in Pretoria, a malarial taint, but Col. Porter was able to show from a series of bloods examined, that in no case was the malarial parasite found, and that, clinically, there were no symptoms resembling in any way malarial fever.

"The M.O. in charge of the Civil Prison stated he had prevented any cases of enteric arising among the prisoners by careful attention to boiling the water. Infection by contaminated mineral waters was of course excluded. Enteric fever was widely prevalent among the civil population."

NOTES FROM THE PUNJAB.—Capt. Birrell writes: "Major B. H. Scott has been appointed Sanitary Officer, Punjab Command, with effect from March 1, 1904, *vice* Major J. C. Weir; tour expired. Capt. W. M. B. Sparkes has been appointed to command of the Station Hospital, Amritsar, *vice* Major E. Davis, transferred to Subathu. The following hill station appointments have been approved for the season, 1904:—Major C. J. Holmes, Cherat; Major J. Fallon, Gharial; Major G. T. Rawnsley, Kuldana; Major W. G. Beyts, Solon; Capt. P. McKessack, Khanspur and Ghora Dhaka; Capt. E. W. Liberry, Thobba; Capt. J. F. Martin, Upper Sopa; Capt. J. Powell, Lower Topa; Lieut. P. Davidson, Kalabagh; Lieut. S. M. W. Meadows, Khyra Gali; Lieut. W. D. C. Kelly, Bara Gali.

"*Departures.*—Capt. R. J. Blackham has been transferred to the Home Establishment, with effect from February 12, 1904, while on leave in England. The undermentioned officers left for England, tour expired, on the dates noted against their names:—

"Lieut.-Col. J. Carmichael, March 8, 1904.

"Major J. C. Weir, March 15, 1904.

"Capt. G. B. Carter, March 8, 1904.

"*Examinations.*—Lieut. A. McMunn qualified in subject (h-i) on March 4, 1904, at Umballa."

NOTES FROM RAWAL PINDI.—Major Rawnsley writes: "The first of the proposed fortnightly meetings, for the discussion of medical and scientific subjects, was held at the Station Hospital on March 16.

"The following officers were present: Lieut.-Col. D. Wardrop, Majors Hanley, Rawnsley, Connor, Capts. McKessack, Browne Mason, Chopping, Wood, Siberry, Martin, Burke, Fry, and Lieut. Davidson, D.S.O.

"The officer commanding the Station Hospital (Lieut. Col. Wardrop) explained the objects of these meetings, and asked officers to bring up all cases of interest. He then made a few remarks on 'Ward Management,' and showed a case of gunshot wound of the hand, where the chief point of interest lay in the total absence of pain or discomfort.

"The following other cases were shown:—

"By Capt. Chopping, R.A.M.C.: A case in which opinions were asked as to whether the patient was suffering from empyema or an abscess of the liver. The case presented many interesting points. The patient had been suffering from pneumonia, and the present symptoms remained. The sputum had been examined, but the microscope had revealed nothing pathogenic. A distinct preponderance of opinion was obtained in favour of a diagnosis of hepatic abscess.

"By Capt. L. Wood, R.A.M.C.: A case presenting uniform enlargement of the left testicle. The enlargement had started in the epididymis, and the diagnosis lay between syphilitic or tubercular disease of the testicle. The consensus of opinion was in favour of syphilis as a cause, and it was decided to try the effect of anti-syphilitic treatment before operating. There were entries on the medical history sheet for tubercle and syphilis.

"By Capt. Fry, R.A.M.C.: A case showing progressive loss of power, starting in the right foot, and extending upwards till all muscles of the leg and thigh were involved. Very little wasting present. No marked sensory symptoms; well-marked knee and ankle clonus. It was also thought by some officers that the left leg was beginning to be affected. The diagnosis lay between a central and spinal

lesion. It was decided to again bring the case forward for further discussion at the next meeting.

"By Capt. Browne, R.A.M.C.: Two cases of frost bite were shown by this officer. The patients were native mule drivers, recently invalided from Chumbi (Sikkim Expeditionary Force). In both cases all the fingers had been frost-bitten of the right hand, due to exposure while holding the reins. The left hands had not suffered so much, as the men were able to protect them by putting them in the armpit; but the index and little finger had suffered in one case, and the little finger in the other.

"The second clinical meeting of officers of the Corps was held at the Station Hospital, Rawal Pindi, on April 6, when the following were present: Lieut.-Col. Wardrop, Majors Hanley, Russell, Rawnsley, Connor, Capts. Browne-Mason, Chopping, Wood, Siberry, Burke and Fry.

"The following cases were shown and discussed:—

"By Capt. Chopping: (1) A Case of Laryngeal Paralysis, following Enteric Fever, complicated by Acute Rheumatism. This was of interest both as regards the complication and sequel.

"(2) The case of paralysis of the right leg shown at the last meeting was again brought up. There was marked improvement now present, as the man can lift the limb some little way off the bed; clonus is still present. He had been treated by mercurial inunction and potassium iodide, grs. x. t. d. s.

"By Major Rawnsley, R.A.M.C.: A Case of Mitral Regurgitation following an Injury. The patient was kicked by a horse at manœuvres. On admission there was a horse-shoe shaped bruise over the spleen, and dulness. The upper part of this rapidly cleared, when chest was found hyper-resonant at lower part, indicating laceration of the lung and pneumo-thorax. Capt. McKessack, under whom the case first was, states in his report that there was no affection of the valves of the heart. Later on it was noticed the heart was affected, and there was pericarditis. The present condition may be due to an adherent pericardium, hindering the proper action of the heart, and so causing regurgitation through incomplete closure of the valve.

"By Capt. Browne-Mason, R.A.M.C.: The case of enlarged testicle shown at the last meeting was again brought to notice. It was now one-half its former size. The patient had been taking potassium iodide in grs. x., doses t. d. s., and had received two intra-muscular injections of mercury cream of m. v. each.

"By Capt. Wood, R.A.M.C.: A Case of Loose Cartilage of the Knee Joint successfully operated on. A discussion followed on the best methods of fixing a loose body in the knee joint prior to operation."

NOTES FROM ST. HELENA.—Major Stalkartt, R.A.M.C., writes: "A change of troops forming the garrison gave a fillip to the somewhat stagnant pulse of life in the island, and though it was with regret we saw the departure in January of the 97th Coy. R.G.A. and the detachment 3rd Manchester Regiment in the H.T. 'Dunera,' which brought their reliefs (viz., the 47th Coy. R.G.A. and the Detachment of the 3rd Lancashire Fusiliers), the welcome to the newcomers was none the less cordial. The R.G.A. are quartered at Laddu Hill, and the 3rd Lancashire Fusiliers have their headquarters at Deadwood; the latter were until last week under canvas, but now occupy a newly-erected hutment—a change which is duly appreciated considering the inclemency of the weather which prevails on the hills for most of the year. Civil Surg. D. Ritchie has arrived from the Cape to relieve Civil Surg. W. L. Spink, who, after two years' sojourn on the island, goes home by this mail to a well-earned holiday."

E. E. Austen, Entomologist, British Museum (Natural History), London, S.W., writes thanking Capt. Stammers, R.A.M.C., for two blood-sucking flies sent from Curepipe, Mauritius:—

"They belong to a species of *Stomoxys* hitherto unrepresented in our collection, and in all probability to the species known as *Stomoxys combinata*, Loew. Since, however, so far as I can discover, no description of this species was ever published, it will have to be described on some future occasion. Will you let Capt. Stammers know that we should be glad of further specimens?"

No. 10 Coy. R.A.M.C., Chatham, opened the Cricket season on May 4 by playing the Army Pay Corps, Chatham, and won the match by 74 runs. In batting for the R.A.M.C., Ptes. Steele, Elliot, and Holden were the principal scorers—30, 28, and 14 respectively. In bowling, Staff-Sergt. C. Delaney took six wickets for 20 runs, and Pte. E. Steele three for 17. The scores were as follows:—R.A.M.C., 116; A.P.C., 42.

On May 7, No. 10 Coy.'s Team, Captained by Lieut. and Quartermaster T. Jacomb, travelled to Hoo St. Mary's, and played the annual fixture with the Hoo St. Mary's Club. No. 10 won the match by 31 runs. The wicket was a very treacherous one, owing to recent heavy rains. In batting for the R.A.M.C. the principal scores were made by Staff-Sergt. H. Allwork and Pte. E. Steele—15 and 16 respectively, and the latter bowled splendidly, taking six wickets for 11 runs. Staff-Sergt. C. Delaney taking three for 21. The scores were as follows:—R.A.M.C., 68; Hoo St. Mary's, 37.

Col. W. J. R. Rainsford, C.I.E., has kindly accepted the Presidency of the Cricket Club for the ensuing season.

CHAS. DELANEY, *2nd Cl. Staff-Sergt. R.A.M.C.*
Hon. Sec. 10th Coy. R.A.M.C. C.C.

The Parkes' Memorial Prize, consisting of 75 guineas and a bronze medal, is awarded every third year to the writer of the best essay on a subject connected with hygiene. The competition is open to the Medical Officers of the Army, Navy, and Indian Services, of Executive Rank on full pay, with the exception of the Professors and Assistant Professors of the Royal Army Medical College, during their term of office.

The subject for the next prize is the following:—"On the Sanitary Requirements of Naval and Military Units in Peace and War; with Suggestions for Complete Schemes of Sanitary Organisation Suitable for both the Navy and Army." (To be illustrated, as far as practicable, from the personal experience of the writer.) Essays to be sent in to the Secretary of the "Parkes' Memorial Fund," Royal Army Medical College, Examination Hall, Victoria Embankment, London, on or before December 31, 1906. Each essay to have a motto, and to be accompanied with a sealed envelope bearing the same motto, and containing the name of the competitor.

(*By order of the Committee of the "Parkes' Memorial Fund."*

Surg.-Gen. Sir WM. TAYLOR, K.C.B., M.D., K.H.P.,
Director-General, *President.*
Col. J. LANE NOTTER, M.A., M.D., *Treasurer.*
Capt. C. E. P. FOWLER, *Secretary.*

BIRTHS.

COTTELL.—On Monday, May 9, 1904, at 23, Nightingale Place, Woolwich, S.E., the wife of Major R. J. C. Cottell, R.A.M.C., of a daughter.

CONDON.—At Kasauli, Punjab, India, on April 17, 1904, the wife of Capt. E. H. Condon, R.A.M.C., of a son.

HEALEY.—March 26, 1904, at Meiktila, Upper Burmah, the wife of Major C. W. R. Healey, R.A.M.C., of a son.

DALY.—March 20, at Claremont, Cape Colony, South Africa, the wife of Major J. H. Daly, R.A.M.C., of a son.

MURRAY.—April 22, at Halifax, N.S., the wife of Lieut.-Col. H. W. Murray, R.A.M.C., of a daughter.

MARRIAGE.

WEBB-PRIESTLEY.— On April 18, at Kirkee, India, Capt. A. Lisle Webb, R.A.M.C., son of the late Dr. J. S. Webb, to Hilda Caroline, daughter of the late T. P. Priestley, of "The Shrubbery," Lee.

DEATHS.

MULRENAN.—On March 20, 1904, at Barrington's Hospital, Limerick, Surg. John Mulrenan, M.D., late Army Medical Department (retired), in his 53rd year. He entered the Service, February 3, 1878, and was placed on half-pay July 16, 1882. He was re-appointed Surg. from half-pay January 16, 1883; being again placed on half-pay May 14, 1885. He retired on retired pay May 14, 1888.

MACADAM.—On April 23, 1904, at Lympstone, Brandon Road, Southsea, Brig.-Surg. Lieut.-Col. John Stannard MacAdam, late Army Medical Staff (retired), in his 67th year. He entered the Service, March 31, 1862, and retired on retired pay August 3, 1892.

BROWNING.—On April 16, 1904, at Dublin, suddenly, after an operation, Christina, the beloved wife of Major Thomas Browning, R.A.M.C.

STANNARD.—On May 2, 1904, in Dublin, Surg.-Lieut.-Col. H. Stannard, late A.M.S., of The Grange, Ballyraggett, Co. Kilkenny, aged 58.

THE VOLUNTEER OFFICERS' DECORATION.

The King has been graciously pleased to confer the Volunteer Officers' Decoration upon the undermentioned Officers of the Volunteer Force, who have been duly recommended for the same under the terms of the Royal Warrant dated July 25, 1892:—

1st Banff Royal Garrison Artillery (Volunteers).—Surg.-Lieut.-Col. William Fergusson, M.D.

1st (Inverness-shire Highland) Volunteer Battalion, The Queen's Own Cameron Highlanders.—Brig.-Surg. Lieut.-Col. Ogilvie Grant, M.B. (retired).

1st Devonshire Royal Garrison Artillery (Volunteers).—Surg.-Major Joseph Willoughby Hodgson, M.B.

1st (City of Bristol) Volunteer Battalion, The Gloucestershire Regiment.—Brig. Surg. Lieut. Col. Arthur William Prichard.

ROYAL ARMY MEDICAL CORPS ANNUAL DINNER.

The Annual Dinner of the Corps will take place on Monday, June 13, at the Hotel Metropole, at 8 o'clock precisely; the Director-General in the Chair. Officers intending to dine are requested to inform the Hon. Secretary as soon as possible, in order that the probable number attending may be known and that tickets may be sent.

All subscribers to the R.A.M.C. Fund, except any who may have expressly excluded the Annual Dinner in the allocation of their subscription, will be entitled to dine at subscribers' rates, provided that their subscriptions are credited to the R.A.M.C. Fund before the date of the Dinner. Also all officers who do not subscribe to the R.A.M.C. Fund, but who still subscribe to the former R.A.M.C. Dinner Fund.

The price of the Dinner to subscribers will be reduced as much as the Fund will permit, but the exact amount cannot be fixed until the number of subscribers attending is known. For the last few years the charge has been 12s. 6d. The amount should be paid personally at the Hotel on the evening of the Dinner.

The price to non-subscribers will be £1 15s., which must be sent by cheque or Post Office Order to the Hon. Secretary when applying for tickets. If the officer is unable to dine the money will be returned.

E. M. Wilson, *Lieut.-Col., R.A.M.C.,*
Hon. Sec. Sub-Committee, R.A.M.C. Dinner Fund.

5, *Drayton Gardens,*
South Kensington, W.

THE ROYAL ARMY MEDICAL CORPS FUND.

NOTICE OF SECOND GENERAL MEETING.

THE Second General Meeting of Subscribers to the Fund will be held in the Theatre of the Royal United Service Institution, on Monday, June 13, 1904, at 3 p.m. The Director-General, Sir William Taylor, K.C.B., K.H.P., will preside.

It is hoped that officers will freely express their views on any points connected with the Fund which they may wish discussed. The Director-General feels that this meeting gives him a unique opportunity of obtaining the real views of the Corps on the important subjects dealt with by the Fund. If subscribers will avail themselves of this opportunity for discussion it will facilitate the work of the Director-General and the Committee in administering the Fund according to the wishes of the subscribers.

He would specially draw the attention of the subscribers to the Compassionate Fund, concerning which he hopes to make a statement.

Those officers who wish for information at the meeting on any special point are asked to communicate with the Hon. Secretary, in order that facts and figures may be collected to elucidate any question asked.

NOTICE TO SUBSCRIBERS.

OFFICERS are particularly requested to give timely notice of changes of station or changes of address, in order to ensure the posting of the Journal to its correct destination.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, &c. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts and commands at home and abroad. All these communications should be written upon one side of the paper only, they should by preference be type-written, but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed to the Editor, JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 68, Victoria Street, London, S.W.

Letters regarding subscriptions, non-delivery of the Journal, or change of address, should be sent to Major T. McCulloch, R.A.M.C., 68, Victoria Street, London, S.W.

Communications have been received from Lieut.-Cols. H. P. Nichols, J. Hickman, W. G. Macpherson, Sylvester; Majors J. Fayrer, A. R. Aldridge, F. Smith, Freyer, C. Blackwell, G. Cree, Leishman, M. P. Holt. Capts. F. M. Mangin, J. C. B. Statham, R. McNaught, D. J. Collins, D. Harvey, J. F. Martin; Lieuts. N. E. Harding, F. W. Lambelle; Major H. Butler, A.V.D., Lieut. S. R. Christophers, I.M.S., E. E. Austen, Esq., British Museum.

In the event of reprints of articles being required by the authors, notification of such must be sent when submitting the papers. Reprints may be obtained at the following rates:—

		s.	d.		s.	d.		s.	d.
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